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July 9, 2013

Mr. Theodore D. Schade
Air Pollution Control Officer
Great Basin Unified Air Pollution Control District
157 Short Street
Bishop, California 93514-3537

Dear Mr. Schade:

Subject: The Los Angeles Department of Water and Power (LADWP) Comments on Great Basin Unified Air Pollution Control District (District) Draft 2013 Annual Air Quality Monitoring Network Plan

On June 14, 2013, the District released for public review and comment its draft *"2013 Annual Air Quality Monitoring Network Plan"* (2013 Network Plan). The 2013 Network Plan includes, in Appendix B a proposed network plan for the National Core (NCORE) monitoring station located at the White Mountain Research Station east of Bishop, California.

LADWP has reviewed the 2013 Network Plan and has numerous questions and concerns about the proposed network and monitoring approach, including the NCORE plan. LADWP is also concerned about the accuracy and reliability of the data generated by the monitoring network and the purpose for which the District is collecting the data.

Air monitoring networks must be designed according to the criteria set out in 40 C.F.R. Part 58, including its appendices. (40 CFR, § 58.11(c); see Id. § 58.10(a)(1), (b)(6).) Those criteria are intended to ensure that state and local networks collect ambient air quality data to support compliance with the National Ambient Air Quality Standards (NAAQS) (e.g., State Implementation Plan (SIP) development and attainment demonstrations), support air pollution research, and allow the public to determine the air quality to which they are being exposed. (Id. Pt. 58, App. D, § 1.1(a)-(c).) Air agencies are required to submit annual monitoring network plans to the pertinent United States Environmental Protection Agency (EPA) Regional

Administrator on or before July 1 of each year (40 C.F.R. § 58.10(a)(1)), describing the monitoring networks established and maintained by the state and local agencies to ensure adequate air quality surveillance as required by EPA monitoring regulations, including information on the purpose, siting and operation of each monitor. (40 CFR, § 58.10.) As discussed below, the 2013 Network Plan does not comply with EPA monitoring network requirements nor does it address the deficiencies identified in the 2012 Ambient Air Monitoring Network Plan (2012 Network Plan). The 2013 Network Plan does not include evidence that sitting and operation of each monitor meets the requirements of appendices A, C, D, and E of 40 C.F.R. 58.10 as required by subdivision (a)(1). Without a compliant network monitoring plan that is approved by EPA, the data cannot be used for determining the attainment status of any areas covered by the plans or impose air quality mitigation requirements upon LADWP nor any other party.

1. Unapproved 2012 Annual Network Monitoring Plan.

The 2013 Network Plan largely resembles the 2012 Network Plan. LADWP submitted written comments on the 2012 Network Plan to the District on May 16, 2012, and to EPA on September 28, 2012. (See Enclosures 1-2.) LADWP also submitted comments on January 8, 2013, after LADWP terminated the District's licenses to operate the Dirty Socks, North Beach and Mill Site monitors. (See Enclosure 3.) EPA has **not** taken action on the 2012 Network Plan that the District Governing Board adopted on May 24, 2012, and submitted to EPA in June 2012. Despite LADWP's requests, the District did not withdraw the 2012 Network Plan and/or amend the plan to remove these monitoring stations, and address the other deficiencies that LADWP identified. The 2013 Network Plan does not resolve LADWP's numerous comments and concerns raised during the administrative process for the 2012 Network Plan. Therefore, LADWP's comments on the 2012 Network Plan are applicable to the 2013 Network Plan and are incorporated by reference.

Under EPA regulations, annual network plans that propose network changes must be submitted to the pertinent EPA Regional Administrator, and must be approved or disapproved within 120 days. (40 CFR, § 58.10(a)(2).) Before EPA can approve the network plan it must satisfy the requirements in 40 C.F.R. Part 58. These adjudications are final agency actions subject to Section 706 of the Administrative Procedures Act. (*See NRDC v. EPA* (9th Cir. 2011) 638 F.3d 1183, 1190.) The District's 2012 Network Plan was subject to EPA approval because it included modifications to the monitoring network, such as showing the T-4 and T-23 monitors as part of the monitoring network even though these monitors were in the process of being relocated. The 2012 Network Plan also includes three monitors (Dirty Socks, North Beach, and Mill Site) that have been removed, as discussed below. The submittal of the 2013 Network Plan does not alleviate the District of its obligation to withdraw the 2012 Network Plan or EPA's obligation to disapprove the 2012 Network Plan if it is not withdrawn by the District.

2. Removal of Dirty Socks, North Beach and Mill Site Monitors from Network.

The 2012 Network Plan and 2013 Network Plan both cannot be approved because they include three monitors that are no longer part of the monitoring network, and there is no certainty that these monitors will be relocated. LADWP terminated the District's licenses to operate the Dirty Socks, North Beach, and Mill Site monitors on November 29, 2012 (Enclosure 4).

EPA notified the District on December 17, 2012, that "all three of these PM_{10} sites are designated as SLAMS [State and Local Air Monitoring Stations] and cannot be shut down or moved without EPA approval. Also, the shutdown of these sites without EPA approval may call into question whether the area is attaining the standard and could also impact the ability of [the District] to develop appropriate emissions inventories and effective control strategies." (Enclosure 5.[1]) According to EPA, the District is required to comply with 40 C.F.R. 58.14, which outlines the required process for discontinuing SLAMS monitors. EPA requested further information to determine if any of these provisions apply, and stated that if 40 C.F.R. 58.14(c)(6) is used as the basis for approval, "the current sites must be replaced with sites of the 'same scale of representation,' which generally means that the replacement site must represent the same conditions and sources as the previous site." (Enclosure 5.) EPA also noted that substantial analysis and "parallel monitoring" would likely be required after a new site is established to determine if the new site represents the same conditions as the former site given that "each of the sites captures its own combination of sources and controls from portions of Owens Lake…." (*Id.*)

LADWP disagrees with EPA that replacement monitors for the former Dirty Socks, Mill Site, and North Beach Monitors are necessary to achieve the NAAQS or ensure compliance with any other existing legal or regulatory requirements. As the District points out on page 18 of the 2013 Network Plan, EPA monitoring regulations require

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[1] LADWP sent a letter to EPA on June 17, 2013, responding to EPA's December 12, 2012, email, to the District. (Attachment 6.)

the presence of only one air quality monitor within the Owens Valley Planning Area (OVPA). Excluding these three monitors, there are 10 monitors in the OVPA – 9 more than required. Thus, there is no legitimate justification to relocate the monitors.

Nevertheless, if the District intends to replace the monitors it cannot simply assume that the Dirty Socks, North Beach, and Mill Site monitoring facilities are still in existence and that these sites can be "swapped out" with new locations and with no new monitoring plan or public review. The Site Reports for North Beach, Mill Site, and Dirty Socks are no longer accurate and should be removed from the 2013 Network Monitoring Plan. The reports incorrectly state that the sites are currently being operated even though the District removed Dirty Socks, North Beach, and Mill Site monitoring facilities from LADWP's property in December 2012. The Site Reports also incorrectly state that there will not be a change in 18 months, when the District knows there has and will be a change. Thus, the 2013 Network Monitoring Plan also does not comply with 40 C.F.R. 58.10(b).

The District has not performed any comparison of the proposed monitors and former monitoring sites, much less the detailed analysis and "parallel monitoring" contemplated by EPA's criteria and requested by EPA staff. Rather, the District sent a letter to EPA on January 28, 2013, stating an assumption that relocating the monitors to sites within one kilometer or less of the previous locations – the "same neighborhood scale distance" – would be sufficient. (Enclosure 6, Exh. B.) This is not correct and is not supported anywhere in the applicable EPA regulations. There is no evidence the new monitors comply with 40 C.F.R. 58.14. The District further fails to provide any specific information in the 2013 Network Plan about the proposed relocation sites, only that they are generally within either 500 meters or 300 meters of the former locations on LADWP property. (2013 Network Plan, pp. 2 [500 meters], 15 [300 meters].) The District cannot merely assume that the information in the Site Reports for the removed monitors will be the same for the new monitors. The monitors' proximity to the former monitor sites is wholly insufficient to show that the proposed locations are representative of the former sites as required by EPA. The District cannot perform this analysis until new location(s) are approved by the property owners.

Despite the District's erroneous representation in the 2013 Network Plan that the monitors are "down temporarily" and will be relocated to new sites on California State Lands Commission (CSLC) or United States Bureau of Land Management (BLM) land "by the end of 2013" (2013 Network Plan, p. 2; Tables 1-3), these monitors have been permanently removed and have so far been out of operation for more than six months. The timeframe for relocating these monitors, if at all, is very uncertain. The District is required to obtain approvals from CSLC and BLM to install, operate and maintain new monitors at the proposed relocation sites, and permission from LADWP to bring electrical power to the proposed air monitors. The District has submitted applications to relocate the monitors, as identified below, but LADWP understands that no approvals have been issued to date.

- The District requested a letter of non-objection from CSLC to install and operate a new monitor (formerly the North Beach monitor) on CSLC-owned land. LADWP sent an objection letter to CSLC on March 22, 2013, stating, among other things, that installing a new monitor at the proposed location would interfere with LADWP's existing Phase 5 dust control project; violate EPA's siting criteria contained in 40 C.F.R. 58 Appendix E (Siting Criteria); violate the District's 2008 Owens Valley PM_{10} Planning Area Demonstration of Attainment State Implementation Plan (2008 SIP). (Enclosure 7) CSLC issued a conditional non-objection letter on April 4, 2013, which requires the District to obtain CSLC's approval of a General Lease. LADWP submitted a second objection letter to CSLC on July 3, 2013, stating that it cannot provide electrical power to the proposed air monitor until the District obtains all required permits and easements from property owners, including completion of all environmental documentation. (Attachment 8.) Assuming the District is able to obtain these approvals, it is unlikely that this process will be complete by the end of 2013.

- The District requested in January 2013 that BLM amend LADWP's Right-of-Way Authorization (ROW) No. CACA 050145 to relocate the Dirty Socks monitor on BLM-owned land. LADWP sent an objection letter to BLM on March 22, 2013. (Enclosure 9.) LADWP stated that installing a new monitor in LADWP's ROW would interfere with LADWP's use of the ROW for mitigation in dust control area T1A-5, and would be incompatible with the legally authorized and publicly beneficial use of the ROW lands; violate the 2008 SIP; and, violate EPA's Siting Criteria. BLM acknowledged that the District's proposed location for the new monitoring station "may get in the way" of LADWP's activities in its ROW, and "construction and travel to the site may increase dust generation in the area where [LADWP] is trying to control these things." (Enclosure 10)

- The District also submitted an application to BLM on January 24, 2013, to amend its ROW No. CACA 042345, to install two new monitors (formerly the Dirty Socks and Mill Site monitors). LADWP sent an objection letter to BLM on May 17, 2013, stating, among other things, that BLM is required to comply with all applicable environmental laws before approving the ROW modification request, particularly in light of the existence of threatened and endangered species in the area; that the proposed locations violate the 2008 SIP and EPA's Siting Criteria; and, that the proposed new monitors are part of the District's network plan that is operating in violation of EPA's Quality Assurance Criteria. (Enclosure 11)

- LADWP sent a second objection letter to BLM on June 19, 2013, in response to emails LADWP received from BLM on May 5, 2013, and June 1, 2013, related to the District's applications to amend LADWP's and/or the District's ROWs to relocate the Dirty Socks and Mill Site monitors. (Enclosure 12) LADWP requested clarification about where specifically the District is requesting to relocate the two air monitors. According to BLM, it has not started processing the District's application to amend ROW 042345. (Enclosure 12, Exh. B.) BLM will also prepare an environmental assessment for the proposed ROW modification before taking any action. (Enclosure 12, Exh. B.)

There is no guarantee that CSLC or BLM will approve the District's requests to install the monitors, or that LADWP will provide electrical power prior to the District obtaining all required permits and completing necessary environmental documentation. Even if the CSLC and BLM ultimately issue the requested modifications and approvals, these approvals may be subject to appeal if any of those agencies' policies have been contradicted. As such, the District's representation in the 2013 Network Plan that the new monitors will be installed and operational by the end of 2013 is highly speculative. The District should, accordingly, revise the 2013 Network Plan to remove all references to Dirty Socks, North Beach, and Mill Site monitors.

If new monitors are added to the network monitoring system, new site reports with accurate information will need to be included in the 2013 Network Monitoring Plan. 40 CFR 58.10(e) requires that "[a]ll proposed additions and discontinuations of SLAMS monitors in annual monitoring network plans and periodic network assessments are subject to approval according to § 58.14."

Thus, the modified plan must be made available to the public for 30 days prior to submission to the EPA Regional Administrator. (40 C.F.R. § 58.14(a).) The 2013 Network Monitoring Plan cannot approve future sites.

3. District Quality Assurance Project Plans.

As stated in the comments submitted by LADWP in connection with the 2011 and 2012 Network Plans, LADWP remains seriously concerned that the District continues to operate its PM_{10} and $PM_{2.5}$ network in the Owens Valley without EPA-approved Quality Assurance Project Plans (QAPP). 40 Code of Federal Regulations (CFR) 58 Appendix A requires, among other things, that *"All monitoring organizations must develop a quality system that is described and approved in quality management plans (QMP) and quality assurance project plans (QAPP)..."* (40 CFR 58 Appendix A, Section 2.1). On September 8, 2011, LADWP requested copies of the District PM_{10} and $PM_{2.5}$ QAPPs. The PM_{10} and $PM_{2.5}$ QAPPs were received from the District on September 22, 2011, and September 27, 2011, respectively. Both QAPPs were unsigned, designated as "**drafts**" (dated March 2001 and November 2002, respectively), and never approved by the EPA. Despite being made aware of this issue for more than two years, both the EPA and District have failed to take corrective action.

In later correspondence related to LADWP's appeal of the District's 2011 Supplemental Control Requirement Determination (SCRD) to the California Air Resources Board (ARB),[2] attorneys for the District argued that the District and other districts have approved QAPPs under the ARB, and that ARB has obtained EPA's approval for the QAPPs. However, the ARB Quality Assurance Plan (QAP)[3] referenced in the District brief does not fulfill the quality assurance project plan requirements in 40 CFR 58 because it does not address all the unique instrument systems and processes that generate the data used to identify supplemental control areas on Owens Lake, nor does it address the District's monitoring organization, among other things. Some of those missing system elements (*e.g.*, sand motion monitoring, video monitoring) are described in the 2013 Network Plan's section on "Dust Identification Program" on page 12. To be clear, while the ARB QAPP does cover the State and Local Air Monitoring Stations (SLAMS) network that is the subject of the 2013 Network Plan, the ARB QAP does not cover the *use* of those

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[2] *See* District's Opposition Brief Regarding the 2011 SCRD Appeal, State of California Air Resources Board, dated April 19, 2012.

[3] The ARB QAP was designed primarily as a guidance document for the operation of quality assurance programs used by the ARB, local air districts, and industry, whereas a QAPP is a more detailed plan that describes the quality assurance procedures for a particular project.

data to identify supplemental dust control areas on Owens Lake because it does not properly assure quality for all the instrument systems that are used in the dust source identification process described in the 2008 SIP.

LADWP requests that the District update its PM_{10} and $PM_{2.5}$ QAPPs, encompassing all of the instrument systems that are required to implement the procedures described in the 2008 Owens Valley SIP, including the monitoring organization structure and functions, and to have them approved in a public proceeding in order to ensure that the data are being collected and analyzed in accordance with EPA-recognized quality assurance procedures.

LADWP also requests that the District complete this work expeditiously, as the unapproved monitoring network is active and currently relied on to identify emissive sources on Owens Lake and the Keeler Dunes, evaluate compliance within the OVPA, and to assess the contributions from Owens Lake as far away as the Coso Junction Maintenance Area (CJMA). The 2013 Network Plan cannot be approved until there are approved QAPPs. The QAPPs cannot be approved until they are updated and the appropriate procedure is followed including public review and consideration at a public hearing. Without an approved QAPP, the data collected by ambient monitors in the Network Monitoring Plans is not quality assured as required by 40 C.F.R. § 58.11(a)(1) and cannot be used for any purposes including attainment determinations or requiring additional controls. Furthermore, the District also cannot submit to the EPA Regional Administrator an annual air monitoring data certification letter to certify data collected at all of its monitors meet criteria in appendix A as required by 40 C.F.R. § 58.15 or report the data to the EPA Administrator as required by 40 C.F.R. § 58.16.

4. Overall Network Design.

The District's network of source impact monitors is focused almost entirely on Owens Lake. This is extremely problematic because the current network does not adequately assess the contributions from other source areas that also affect air quality within the OVPA, which is much larger than simply Owens Lake and which has a well-recorded history of intense dust storms prior to any diversions from the Owens River. LADWP raised this issue in its comments to the 2011 and 2012 Network Plans, but the District did not resolve the issue in the 2013 Network Plan.

Of the 18 monitors listed in the draft 2013 Network Plan, 12 are designated as "source impact" monitors, and all of these source impact monitors are located on or immediately around Owens Lake and the Keeler Dunes.[4] Given the fact that high PM_{10} concentrations originate from sources upwind and downwind of Owens Lake, the District should extend its network to encompass some of these source areas, which affect local communities as well as the overall attainment status of the OVPA. LADWP has provided abundant evidence to the District over the years establishing that high PM_{10} concentrations originate outside of Owens Lake, yet the District has resisted these facts. LADWP requests that the District identify the major off-lake source areas. Further, all of the source impact monitors should be designated as special purpose monitors because they are not suitable for comparison with and determination of the area's compliance with the NAAQS. The 2013 Network Monitoring Plan should be revised accordingly.

The Owens Lake network described on pages 11-12 of the 2013 Network Plan states that *"An additional monitor is located 20 miles south of the lake at Coso Junction."* It is difficult to conceive how a single monitor, located some 20 miles south of Owens Lake with large and obvious off-lake sources in between, can be technically considered part of the Owens Lake network. As discussed below, the Coso Junction monitor site is problematic and does not accurately measure concentrations from Owens Lake. The District should remove this statement from the 2013 Network Plan.

5. <u>The Data from the 2013 Network Plan will be Improperly Used in an Invalid Dust ID Model.</u>

The 2013 Network Plan states (p. 12) that the ambient air monitoring stations are utilized for the District's Dust Identification Program (Dust ID Model). The Dust ID Model violates EPA's regulations, and therefore the data collected pursuant to the 2013 Network Plan should not be utilized for the Dust ID Model. The Dust ID Model has never been expressly approved for use at Owens Lake by either EPA or ARB.

The Dust ID Model is built on faulty assumptions. The District gathers sand motion data using devices known as Sensits and Cox Sand Catchers (CSCs) which, in combination, are intended to provide a measurement of horizontal sand flux. CSCs are passive devices that can collect sand for over a month or more, depending on activity level. Sensits are electronic detectors that count the number of sand particles

[4] As discussed in Section 2, above, the 18 monitors listed in the 2013 Network Plan mistakenly include the three source impact monitors at the Dirty Socks, North Beach and Mill Site locations that were removed by the District in December 2012 and which have been out of operation for more than six months.

that strike the sensor in a 5-minute period.[5] The Sensit particle counts are then used to apportion the sand that the CSCs collected to a 5-minute resolution. The District assumes, without any scientific basis, that there is a linear relationship between the sand mass collected by the CSCs and cumulative Sensit motion detector counts. The sand flux data are then mapped to the alleged emissive areas that were defined in the first step. The District assumes that the horizontal sand flux data generated by the Sensits/CSCs are proportional to the PM_{10} emissions, with the proportional factor called a "K-factor." K-factors are defined for larger geographic areas, referred to as "source areas." The Dust ID model K-factors are not known but must be derived from the air quality data and dispersion model used in the Dust ID model, which is the CALPUFF model. This is done by first running CALPUFF with an initial K-factor of $5x10^{-5}$ to generate modeled hourly PM_{10} concentrations at each of the ambient air monitoring sites located on and around the lake. Then, for each monitoring site, the initial K-factors are adjusted to force agreement between the modeled concentration and the actual monitored PM_{10} concentrations. These resultant K-factors are then screened to eliminate hours with poor source receptor alignment. Those values passing the screens are then grouped by lakebed area (i.e., Central, North, South, and Keeler dunes) and further stratified by "season" in a highly subjective process. Then for each area and season, the 75th percentile K-factors are determined. If there is an insufficient number of calculated K-factors for a season and lakebed area (at least 9), then a predefined set of default K-factors are used, as explained in the 2008 SIP. The revised K-factors and sand flux data are then run in CALPUFF again to generate 24-hour predictions of PM_{10} concentrations at the "regulatory shoreline."

The Dust ID Model is not an EPA-approved model. The District improperly utilizes CALPUFF. CALPUFF is approved by EPA as a long range dispersion model. (Enclosure 13 [Revision to the Guideline on Air Quality Models, Final Rule, 68 Fed. Reg. 18440 (April 15, 2003].) EPA has not approved CALPUFF for "near-field" applications as it is used for at Owens Lake. (Enclosure 14 [EPA Clarification Memo, 8/13/2008, pp. 1-3, 6].) AERMOD, which is not used by the District, is the model approved by EPA for "near-source" or "near-field" assessments. (Enclosure 15 [Revision to the Guideline on Air Quality Models, Final Rule, 70 Fed. Reg. 68218, (Nov. 9, 2005)]; Enclosure 14 [EPA Clarification Memo, 8/13/2008, pp. 1-3, 6].)

The District has failed to obtain the required EPA pre-approval to use the Dust ID Model. Since CALPUFF is not an EPA approved model for "near-source" or "near-

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[5] The District has also applied to BLM to amend its ROW No. CACA 046216 to add three new sand motion monitoring sites (Sensits). LADWP sent a letter to BLM on April 25, 2013, objecting to the District's request. LADWP sent a second letter to BLM on June 19, 2013, responding to an email from BLM received on May 5, 2013. According to BLM, it has not taken any action on the District's request, and will prepare an environmental evaluation before taking action on the District's request.

field" assessments, EPA rules require that prior approval be obtained from EPA when using alternative models for regulatory purposes. (40 C.F.R. Part 51, Appendix W, § 3.2.2.(a); Enclosure 15 [Revision to Guideline on Air Quality Models, Final Rule, 70 Fed. Reg. at 68232 (Nov. 9, 2005).]; Enclosure 14 [EPA Clarification Memo, 8/13/2008, pp. 4-5].) In order to obtain EPA approval, the model must be evaluated from both a theoretical and performance perspective, and it must be demonstrated that the model meets eight specific criteria. (40 C.F.R. Part 51, Appendix W, §§ 3.2.2.(b)-(d)]; Enclosure 14 [EPA Clarification Memo, 8/13/2008, pp. 4-6].) The District has not performed the required demonstration that is a prerequisite to EPA approval of CALPUFF for these purposes. Absent EPA's approval, CALPUFF cannot be used for regulatory purposes.

The Dust ID Model also violates EPA calibration rules. The Dust ID model depends largely on the accuracy and reliability of the "K-factors" to predict ambient PM_{10} concentrations at the regulatory shoreline. As discussed above, the District uses the CALPUFF model to back-calculate the K-factors that are used to produce hourly emission rates at the regulatory shoreline. Specifically, the District compares the model's estimate of PM_{10} concentrations with the actual monitored PM_{10} concentrations recorded by the ambient monitoring system at the regulatory shoreline, and adjusts the initial K-factors to force agreement with the actual monitored PM_{10} concentrations. Thus, K-factors are derived from the data set being evaluated and are simply calibration factors for CALPUFF.

The calibration of CALPUFF with its own results violates EPA modeling rules (40 C.F.R. Part 51, Appendix W, § 7.2.9), and highlights the inaccuracy, unreliability, and lack of credibility supporting the results generated by the District's Dust ID model. The EPA rules on air quality modeling provide (emphasis added):

> 7.2.9 Calibration of Models
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> Calibration of models is not common practice and is subject to much error and misunderstanding. ***There have been attempts by some to compare models estimates and measurements on an event-by-event basis and then to calibrate a model with results of that comparison.*** This approach is severely limited by uncertainties in both source and meteorological data and therefore it is difficult to precisely estimate the concentration at an exact location for a specific increment of time. ***Such uncertainties make calibration of models of questionable benefit. Therefore, model calibration is unacceptable.***

Thus, pursuant to EPA Rules, the calibration of the model renders the results "subject to error much and misunderstanding," "severely limited," "of questionable benefit," and, ultimately, "unacceptable" to EPA. (40 C.F.R. Part 51, § 7.2.9.)

The Dust ID Model does not properly account for the contributions of off-lake sources on the ambient air monitoring system concentrations prior to calculating K-factors. There are significant non-LADWP-related sources of PM_{10} emissions that affect the ambient air monitoring system concentrations. According to EPA, background concentrations are an essential part to be considered in determining source impacts. (40 C.F.R. Part 51, § 8.2.1.) EPA rules state that background sources (i.e., natural sources, nearby sources, and unidentified sources) should be determined under appropriate procedures described in 40 C.F.R. Part 51, §§ 8.2.1 to 8.2.3.) The Dust ID Model does not comport with EPA requirements and is not appropriate.

The Dust ID Model does not have the requisite accuracy and reliability. According to EPA, models lack the fundamental capacity to show actual concentrations at a precise location and time or that a precise location caused an exceedance, the exact task for which the District uses the Dust ID Model. (40 C.F.R. Part 51, Appendix W, § 9.1.2., Studies of Model Accuracy, (a) ["However, estimates of concentration that occur at a specific time and site, are poorly correlated with actually observed concentrations and are much less reliable"].)

The Dust ID Model's performance was evaluated under three different measurements for the 2011 SCRD: (1) Fractional Bias using paired data (i.e., data paired in both space and time); (2) Scatter Plots with regression statistics using paired data; and (3) Quantile:Quantile (Q:Q) Plots using unpaired data. Under the first two measures (fractional bias and scatter plots), a modeled dust concentration is compared with the actual observed concentration at the same location (ambient air monitor) for the same 24-hour or hourly period. The third measure (Quantile:Quantile, or Q:Q, Plots) evaluates how well the distribution of modeling results mimics the distribution of observed concentrations; however, it removes the time and space connection between the modeled and observed concentrations that are essential for accurately calculating emission rates on the Owens playa using the Dust ID Model. The Dust ID Model was shown to be inaccurate and unreliable by two of the three performance evaluation measures – it over-predicts PM_{10} concentrations and had zero to very low predictive capability. The selection of the 75th percentile K-factor contributes to the models over-estimating PM_{10} concentrations.

Fractional bias is an EPA-approved statistical measure of bias; that is, the tendency of a model to under-predict or over-predict the observed concentrations at Owens

Lake shoreline monitors. The absence of bias provides evidence that the model is accurately predicting values whereas the existence of bias in the modeled values is evidence of a lack of reliability or accuracy with the model. Scatter Plots are visual graphs showing "scatter" of 24-hour-average predicted versus observed data points (with observed values on vertical axis, predicted values on the horizontal axis). In the case of a perfect linear correlation between the predicted versus observed variables, the data points would all fall on the same straight line. Scatter Plots are particularly useful to show how well the Dust ID Model predicts the monitored concentrations on a daily, or alternatively, as is the case for K-factors, an hourly basis. Finally Q:Q Plots are a type of scatter plots similar to regression plots, except that, as discussed above, they are based upon unpaired rather than paired data. Whereas scatter plots compare observed versus predicted PM_{10} concentrations at a single location over the same 24-hour period, in a Q:Q Plot, the maximum daily observed PM_{10} concentration (all days in a year) is plotted against the maximum daily predicted concentration (all days in a year), the second highest observed concentration is compared with the second highest predicted concentration, and so on. Model performance is considered "acceptable" by the EPA under Q:Q Plot evaluation if most of the data points lie within a factor-of-two difference from a diagonal line through the origin.

LADWP evaluated the performance of the Dust ID Model for the 2006-2010 period encompassed in the 2011 SCRD using all three statistical measures. The results of the paired fractional bias testing conducted showed the model systematically over-predicts dust concentrations at the Owens Lake shoreline monitors. The consistent over-prediction of areas on the lakebed means the model is biased and wrongly identifies "Lone-Violator" areas for dust control.

Under the scatter plot analysis the regression statistics revealed the model lacks predictive capability. The results of the performance evaluation showed significant variability when the data points were paired in space and time, meaning that observed "scatter" was generally high when the modeled concentrations were low and vice versa. For example, for dust sources on the Owens playa, the Keeler monitor had 0% predictability, Shell Cut (1%), Flat Rock (3%), Lone Pine (8%), Olancha (9%), Ash Point (9%), North Beach (14%), Dirty Socks (15%) and Lizard Tail (58%). EPA recognizes that poor correlations between paired concentrations at fixed monitoring stations call into doubt findings on precise time and location – exactly what the model was used for in the 2011 SCRD. (40 C.F.R. Part 51, Appendix W, § 9.1.2; *see also* Enclosure 16 [EPA Clarification Memo, 9/26/2008, p. 9 ["If the modeling system lacks demonstrable skill in terms of temporal/spatial pairing of impacts. . .then the argument for applicability to the problem [required criteria per 40 C.F.R. Part 51, Appendix W, § 3.2.2(ii)] is seriously undermined"]].)

Only under the Q:Q Plot evaluation method did the Dust ID Model perform to arguably "acceptable" standards because most of the points fell within a factor-of-two difference from a diagonal line through the origin. However, as noted above, Q:Q plots are a less detailed and therefore less reliable evaluation measure because they use data that are unpaired in time and space. Thus, for example, on Owens Lake, every dust storm, and every hour during a dust storm, has a different pattern of emissions. Un-pairing the time and space data "decouples" the source-receptor relationship - a time and space relationship that is required for calibration of the K-factors and identifying "Lone Violator" areas. The data points in a "un-pair" may reflect entirely different times and therefore different source areas on the playa in what amounts to an "apples-to-oranges" comparison. Unlike a typical point source such as a smokestack where Q:Q plots may be applicable, source areas on the 110 square mile Owens Lakebed are highly variable in location and emissivity over time making Q:Q plots meaningless for this application. Consequently, the un-paired Q:Q Plot results are considerably less reliable as a measure to evaluate the Dust ID model than the paired results provided by the fractional bias and scatter plot analyses.

6. Comments on individual Monitors.

Keeler PM_{10} and $PM_{2.5}$ Monitors

The Keeler $PM_{2.5}$ and PM_{10} monitors appear to violate the EPA siting criteria contained in 40 CFR 58 Appendix E.[6] The Keeler monitors are located atop the District laboratory building near the center of town, and are surrounded by a network of unpaved streets and roadways that can be dusty under high winds with no traffic. The old State Highway leading south out of Keeler is especially emissive because the old asphalt is seriously degraded and sand covers many parts of the roadway. This old road continues to be used as a shortcut to Highway 136 and dust plumes generated by passing vehicles have been observed to cross the Keeler PM_{10} monitor under southerly winds. Moving the monitor to the north edge of town would eliminate some of these local influences and provide a more representative sample of the air quality arriving from sources located outside of town. At a minimum, the District should consider paving the road that runs along the east side of their laboratory facility (the west side is paved) because that road is still open and actively used.

[6] 40 CFR Part 58, Appendix E, 3. Spacing From Minor Sources: "The plume from the local minor sources should not be allowed to inappropriately impact the air quality data collected at a site. Particulate matter sites should not be located in an unpaved area unless there is vegetative ground cover year round, so that the impact of windblown dusts will be kept to a minimum."

North Beach PM_{10} Monitor

As discussed in Section 2, above, the North Beach monitor was removed by the District in December 2012 and has been out of operation for more than six months. The District should revise the 2013 Network Plan to remove all references to this monitor.

Flat Rock PM_{10} Monitor

The 2013 Network Plan states that during May 2011 the PM_{10} monitor at Flat Rock was shut down and moved northeast to the Mill Site. (2013 Network Plan, p. 15.) The 2013 Network Plan states that the Flat Rock monitor was being impacted by emissions from areas between the monitor and the 3,600-foot regulatory shoreline; however, it is not apparent from the text of the 2013 Network Plan whether these emissions were the reason for discontinuing the Flat Rock monitor and relocating it to the Mill Site. It is extremely important to know why these changes were made. As noted in LADWP's comments on the 2012 Network Plan, the Flat Rock dune area is just one of several off-lake source areas that are known to affect shoreline monitors under certain meteorological conditions. The District *should* be monitoring the emission contribution from these known off-lake sources – not removing monitors ideally placed to record the contributions from off-lake dust sources. The District should revise the 2013 Network Plan to clarify its reasons for removing the Flat Rock monitor.

Mill Site PM_{10} Monitor

As discussed in Section 2, above, the Mill Site monitor was removed by the District in December 2012 and has been out of operation for more than six months. The District should revise the 2013 Network Plan to remove all references to this monitor.

Dirty Socks PM_{10} Monitor

As discussed in Section 2, above, the Dirty Socks monitor was removed by the District in December 2012 and has been out of operation for more than six months. The District should revise the 2013 Network Plan to remove any and all references to this monitor.

Coso Junction PM_{10} Monitor

The monitoring objective for Coso Junction is "Population Oriented, Pollutant Transport." This monitor location is neither population oriented nor appropriate for assessing pollutant transport. The Coso Junction monitor is in violation of EPA's siting criteria (see 75 Federal Register 54031 (September 3, 2010)). Further, there are numerous sources improperly influencing the monitoring data, including open grazing north of Coso Junction. (Enclosure 17 [March 23, 2012, letter to EPA].) The data from the Coso Junction PM_{10} monitor also remains unreliable and cannot be used to assess the emission contributions from Owens Lake for the reasons outlined in LADWP's May 16, 2012, comments on the District's 2012 Network Plan. Specifically: (i) the Dust ID model has very poor predictive capability, even at the relatively short plume transport distances across Owens Lake; (ii) the Dust ID modeling protocol described in the 2008 SIP does not address the unique surface and meteorological conditions that prevail over the long transport distances between Owens Lake and the Coso Junction Maintenance Area (CJMA); and (iii) the Dust ID model does not include any of the several known off-lake source areas that influence downwind dust concentrations, and which are therefore critical for apportioning the PM_{10} concentrations arriving at the Coso Junction monitor. Some but not all of these non-Owens Lake dust sources were documented in the March 23, 2012 letter (Enclosure 17.)

7. Specific Comments on 2013 Network Plan.

Page 1: EPA regulations require that the 2013 Network Plan be submitted to EPA for review and approval by no later than July 1, 2013, after expiration of the requisite 30-day public comment period. The District did not publish the 2013 Network Plan until June 14, 2013, and appears to plan on submitting it to EPA sometime after the Governing Board hearing on July 15, 2013. Thus, the District's submittal of the 2013 Network Plan is not timely.

Page 1: The District states that the intent of the 2013 Network Plan is to "describe the network of monitors to be operated by the District *during the 2012 calendar year*." (Emphasis added.) This is presumably a typographical error as the purpose of the 2013 Network Plan is to summarize and describe the District's network of monitoring facilities to be operated during the 2013 calendar year.

Page 2: The District fails to provide any specific information in the 2013 Network Plan about the proposed relocation sites for the Dirty Socks, North Beach, and Mill Site monitors, only that they are generally within either 500 meters or 300 meters of the former locations on LADWP property.

Pages 6-8, Tables 1-3: The Dirty Socks, North Beach and Mill Site monitors have been removed and have been inactive since December 2012 and should therefore be removed from Tables 1 through 3.

Pages 6-8, Tables 1-3: The Special Purpose Monitors at T-4 and T-23 were discontinued in July and August 2012, respectively, and should therefore be removed from Tables 1 through 3.

Pages 6-8, Tables 1-3: The 2013 Network Plan should remove all reference to the Simis Residence monitor. The Simis Residence PM_{10} monitor was decommissioned in August 2008, and the meteorological monitoring was suspended in July 2011. No monitoring at this location is planned for 2013.

Page 9, "Core-Based Statistical Area": This phrase appears nowhere else in the document and should be removed from this list of definitions.

Page 9, "Micropolitan Statistical Area": This phrase appears nowhere else in the document and should be removed from this list of definitions.

Page 12, Dust Identification Program: The text refers to the map included as Figure 4 that details the monitoring sites used for the District's Dust ID program, with the caveat that the Dirty Socks, North Beach and Mill Site monitors are "temporarily down due to lease cancellation." As discussed in Section 2, above, the discontinuance of these monitors is not temporary. The District should remove all references to these monitors from the 2013 Network Plan.

Page 14, Mono Lake: This paragraph contains outdated information about the Simis Residence monitor, which was discontinued in August 2008. The out-of-date information should be removed from this paragraph.

Page 15, 5.0 Recent or Proposed Modifications to Network, Owens Lake: This paragraph again discussing the "temporary" removal of the Dirty Socks, North Beach and Mill Site monitors and states that the District anticipates having them back in operation at the new locations on CSLC and BLM land by the close of 2013. As discussed in Section 2, above, the discontinuance of these monitors is not temporary. The District should remove all references to these monitors from the 2013 Network Plan.

Page 18, 6.0 Minimum. Monitoring Requirements, PM_{10}: The tabulated data in this section indicate that there are 12 active monitors in the Owens Lake non-attainment area. By LADWP's count, there are 6 monitors currently active and anticipated to collect data for 2013 for attainment purposes (Shell Cut, Bill Stanley, Olancha, Lone Pine, Lizard Tail, and Keeler). North Beach, Mill Site, and Dirty Socks are shut down. T-7 and T-27 are special purpose monitors and are not used for attainment purposes.

Appendix A, Quality Assurance Audits: The document identifies purported audits, but no specific information is provided. It is difficult to understand how audits can be performed without approved QAPPs. LADWP requests copies of the audits for its review and comment prior to the District's consideration of the 2013 Network Plan.

Appendix A, Site Information: The District references purported quality assurance audits, but there is no information about the outcome of the audit in the Appendix or elsewhere in the 2013 Network Plan. The District should include this information.

Appendix B, NCORE Plan, Quality Assurance Status, p. 3: This paragraph implies that the District has its own quality assurance plans when it states: *"Quality Assurance Project Plans from the CARB and the District cover PM_{10}, $PM_{2.5}$ and meteorological measurements."* As discussed in Section 3, above, the District does not have its own approved PM_{10} QAPP and so that statement should be clarified. EPA, however, incorrectly believes that the District has its own independent QAPP because of the statements made in their 2008 Technical Systems Audit of the ARB air quality network.[7]

- "During the audit, EPA received a copy of GBUAPCD's most recent PM_{10} QAPP which will be reviewed for approval by Region 9." (2008 Technical Systems Audit, p. 42.)
- "**Finding GB1:** Great Basin operates an independent monitoring, laboratory and QA program from that of ARB." (2008 Technical Systems Audit, p. 43.)
- "**Discussion GB1:** GBUAPCD has independent QAPPs for its $PM_{2.5}$ and PM_{10} monitoring programs and laboratory operations. The QAPPs incorporate SOPs written by the District. QA oversight by ARB consists of a flow audit once per year." (2008 Technical Systems Audit, p. 43.)

The 2013 Network Plan should clarify the nature and approval status of the District's PM_{10} and $PM_{2.5}$ QAPPs.

[7] Technical Systems Audit of the ARB, 2007, conducted by the US EPA Region 9 in August 2008.

8. Conclusion.

The 2013 Network Plan directly violates EPA rules and protocols, and perpetuates a reckless and biased approach to air quality management in the OVPA. The District and EPA must be held to the reasonable expectation that they will follow air quality regulations and therefore they cannot approve the 2013 Network Plan given the Plan's significant deficiencies, as outlined above. LADWP requests that the District revise the 2013 Plan and then reissue the Plan for further public review and comment before it is considered by the District Governing Board and submitted to EPA.

If you have any questions, please contact me at (213) 367-1014, or Mr. William T. Van Wagoner, Manager of Owens Lake Regulatory Issues and Future Planning, at (213) 367-1138.

Sincerely,

Martin L. Adams
Director of Water Operations

WTVW:rdn
Enclosures
c: Dr. Matthew Lakin, U.S. Environmental Protection Agency, w/enclosures
Mr. Larry Biland, U.S. Environmental Protection Agency, w/enclosures
Mr. Michael Flagg, U.S. Environmental Protection Agency, w/enclosures
Ms. Sylvia Oey, California Air Resources Board, w/enclosures
Dr. Mark Schaaf, Air Sciences, Inc.
Mr. William T. Van Wagoner

Enclosure 1

Department of Water and Power the City of Los Angeles

ANTONIO R. VILLARAIGOSA
Mayor

Commission
THOMAS S. SAYLES, *President*
ERIC HOLOMAN, *Vice President*
RICHARD F. MOSS
CHRISTINA E. NOONAN
JONATHAN PARFREY
BARBARA E. MOSCHOS, *Secretary*

RONALD O. NICHOLS
General Manager

May 16, 2012

Mr. Theodore D. Schade
Air Pollution Control Officer
Great Basin Unified Air Pollution Control District
157 Short Street
Bishop, California 93514-3537

Dear Mr. Schade:

Subject: Los Angeles Department of Water and Power Comments on Great Basin Unified Air Pollution Control District 2012 Ambient Air Monitoring Network Plan

On April 20, 2012, the Great Basin Unified Air Pollution Control District (GBUAPCD) released for public review and commentary its proposed "*2012 Ambient Air Monitoring Network Plan*" (2012 Network Plan). The 2012 Network Plan includes, as Appendix B, a proposed network plan for the National Core (NCORE) monitoring station located at the White Mountain Research Station east of Bishop, California.

The Los Angeles Department of Water and Power (LADWP) has reviewed the 2012 Network Plan and has a number of questions and concerns regarding the proposed network and monitoring approach, including the NCORE plan.

1. GBUAPCD Quality Assurance Project Plans.

   LADWP is concerned that the GBUAPCD has been operating its PM_{10} and $PM_{2.5}$ network in the Owens Valley without U.S. Environmental Protection Agency (EPA)-approved Quality Assurance Project Plans (QAPP). 40 Code of Federal Regulations (CFR) 58 Appendix A requires, among other things, that "*All monitoring organizations must develop a quality system that is described and approved in quality management plans (QMP) and quality assurance project plans (QAPP)...*" (40 CFR 58 Appendix A, Section 2.1). On September 8, 2011, LADWP requested copies of the GBUAPCD PM_{10} and $PM_{2.5}$ QAPPs. The PM_{10} and $PM_{2.5}$ QAPPs were received from the GBUAPCD on September 22, 2011, and September 27, 2011, respectively. Both QAPPs were unsigned, designated as "drafts" (dated March 2001 and November 2002, respectively), and presumably never approved by the EPA.

In later correspondence related to LADWP's appeal of the GBUAPCD 2011 Supplemental Control Requirement Determination (SCRD) to the California Air Resources Board (ARB),[1] attorneys for the GBUAPCD argued that the GBUAPCD and other districts have approved QAPPs under the ARB, and that ARB has obtained EPA's approval for the QAPPs. However, the ARB Quality Assurance Plan (QAP)[2] referenced in the GBUAPCD brief does not fulfill the quality assurance project plan requirements in 40 CFR 58 because it does not address all the unique instrument systems and processes that generate the data used to identify supplemental control areas on Owens Lake, nor does it address the GBUAPCD's monitoring organization, among others. Some of those missing system elements (e.g., sand motion monitoring, video monitoring) are described in the 2012 Network Plan's section on "Dust Identification Program" on page 11. To be clear, although the ARB QAPP does cover the State and Local Air Monitoring Stations (SLAMS) network that is the subject of the 2012 Network Plan, the ARB QAPP does not cover the *use* of those data to identify supplemental dust control areas on Owens Lake because it does not properly assure quality for all the instrument systems that are used in the dust source identification process described in the 2008 SIP.

LADWP requests that GBUAPCD update its PM_{10} and $PM_{2.5}$ QAPPs, encompassing all of the instrument systems that are required to implement the procedures described in the 2008 Owens Valley SIP, including the monitoring organization structure and functions, and to have them approved in a public proceeding in order to ensure that the data are being collected and analyzed in accordance with recognized quality assurance procedures.

LADWP also requests that GBUAPCD complete this work expeditiously, as the monitoring network is active and currently being used to identify emissive sources on Owens Lake and the Keeler Dunes, evaluate compliance within the Owens Valley Planning Area, and to assess the contributions from Owens Lake as far away as the Coso Junction Maintenance Area.

2. <u>Overall Network Design</u>.

The GBUAPCD's network of source impact monitors is focused almost entirely on Owens Lake. This is problematic because the current network does not adequately assess the contributions from other source areas that also affect air quality within the Owens Valley Planning Area, which is much larger than simply Owens Lake. Of the 18 monitors listed in the draft 2012 Network Plan, 11 are designated as "source impact" monitors, and all of these source impact monitors are located on or immediately around Owens Lake and the Keeler Dunes. Given the fact that high PM_{10} concentrations originate from sources upwind and

[1] GBUAPCD's Opposition Brief Regarding the 2011 SCRD Appeal, State of California Air Resources Board, dated April 19, 2012.

[2] The ARB QAP was designed primarily as a guidance document for the operation of quality assurance programs used by the ARB, local air districts, and industry, whereas a QAPP is a more detailed plan that describes the quality assurance procedures for a particular project.

downwind of Owens Lake, the GBUAPCD should extend its network to encompass some of these source areas, which affect local communities as well as the overall attainment status of the Owens Valley Planning Area. LADWP has provided abundant evidence to GBUAPCD over the years that high PM_{10} concentrations originate outside of Owens Lake. LADWP requests that GBUAPCD identify the major off-lake source areas (including the Olancha Dunes and the string of ancient dry riverbeds just north of Owens Lake along the eastern side of the valley) and monitor them for both sand motion and dust emissions. This information would have assisted the GBUAPCD in their recent assessment of the contribution of Owens Lake dust emissions at the Coso Junction PM_{10} monitor, located 18 miles south of Owens Lake. The GBUAPCD's modeling analysis did not include any off-lake dust sources because the information required to characterize those sources is not being collected by GBUAPCD. If the GBUAPCD is truly interested in understanding the sources of dust that are affecting the Coso Junction monitor, then it should expand its source-impact monitoring network beyond Owens Lake.

The Owens Lake network described on page 10 of the 2012 Network Plan states that *"An additional monitor is located 20 miles south of the lake at Coso Junction."* This begs the question of how a single monitor, located some 20 miles south of Owens Lake with large off-lake sources in between, can be considered part of the Owens Lake network. The GBUAPCD should either explain its reasoning more thoroughly or remove this statement from the 2012 Network Plan.

3. <u>Comments on Individual Monitors.</u>

Keeler PM_{10} and $PM_{2.5}$ Monitors

The Keeler $PM_{2.5}$ and PM_{10} monitors appear to violate the EPA siting criteria contained in 40 CFR 58 Appendix E.[3] The Keeler monitors are located atop the GBUAPCD laboratory building near the center of town, and is surrounded by a network of unpaved streets and roadways that can be dusty under high winds with no traffic. The old State Highway leading south out of Keeler is especially emissive because the old asphalt is seriously degraded and sand covers many parts of the roadway. This old road continues to be used as a shortcut to Highway 136 and dust plumes generated by passing vehicles have been observed to cross the Keeler PM_{10} monitor under southerly winds. Moving the monitor to the north edge of town would eliminate some of these local influences and provide a more representative sample of the air quality arriving from sources located outside of town. At a minimum, GBUAPCD should consider paving the road that runs along the east side of their laboratory facility (the west side is paved) because that road is still open and actively used.

[3] 40 CFR Part 58, Appendix E, 3. Spacing From Minor Sources: "The plume from the local minor sources should not be allowed to inappropriately impact the air quality data collected at a site. Particulate matter sites should not be located in an unpaved area unless there is vegetative ground cover year round, so that the impact of wind blown dusts will be kept to a minimum."

North Beach PM_{10} Monitor

The North Beach PM_{10} monitor also appears to violate the EPA siting criteria contained in 40 CFR 58 Appendix E. The location of the North Beach monitor is especially problematic because it is located adjacent to two heavily used unpaved roads: a north-south gravel haul road leading to the Zone 1 shallow flood areas, and the (very dusty) east-west Boulder Creek Road used for local access. Several years ago before the North Beach monitor was installed, LADWP requested that the GBUAPCD place a TEOM along the shoreline north of Study Area 1, away from roads and at a point that the Dust ID model predicted relatively high 24-hour PM_{10} concentrations from on-lake wind directions. LADWP did not agree with the North Beach site that the GBUAPCD eventually chose. LADWP recommends that this station be moved west to the site we originally proposed.

Flat Rock PM_{10} Monitor

The 2012 Network Plan states that during April 2011, the PM_{10} monitor at Flat Rock was shut down and moved northeast to the Mill Site (page 10, last paragraph). The 2012 Network Plan gives no reason why the Flat Rock station was discontinued, or why the Mill Site was chosen. It is important to know why these changes were made. Both LADWP and the GBUAPCD have evidence that the Flat Rock monitor was recording emissions from an off-lake source area located between it and the regulatory shoreline. That could have been the reason for the move. However, the Flat Rock dune area is just one of several off-lake source areas that are known to affect shoreline monitors under certain meteorological conditions. The GBUAPCD *should* be monitoring the emission contribution from known off-lake sources. The removal of the Flat Rock dunes monitor appears to be another example of the GBUAPCD's reluctance to acknowledge the contributions from off-lake dust sources.

Off-lake source areas also influence the new Mill Site. Screening for on-lake wind directions cannot remove the influences of off-lake sources.

Coso Junction PM_{10} Monitor

EPA has noted that GBUAPCD determined that the Coso Junction monitoring site had been violating siting criteria since January 2010 (75 Federal Register 54031 (September 3, 2010)). LADWP requests documentation that the noted violations have been corrected. Additionally, LADWP cautions the GBUAPCD that the data from the Coso Junction PM_{10} monitor cannot be used to assess the contributions from Owens Lake because: (1) the Dust ID model has very poor predictive capability, even at the relatively short plume transport distances across Owens Lake, (2) the Dust ID modeling protocol described in the 2008 SIP does not address the unique surface and meteorological conditions that prevail over the long transport distances between Owens Lake and the Coso Junction Maintenance Area (CJMA), and (3) the Dust ID model does not include any of the several known off-lake source areas that influence downwind dust concentrations, and which are therefore critical for apportioning the PM_{10} concentrations arriving at the Coso Junction monitor. Some but not all of these non-Owens Lake dust sources were documented in a letter to the EPA on March 15, 2012 (copied to the GBUAPCD).

At a minimum, LADWP recommends that GBUAPCD install another PM_{10} monitor at the north end of the CJMA in order to assess the incoming PM_{10} concentrations there.

4. Specific Comments on 2012 Network Plan.

Page 6, Table 1: The Special Purpose Monitors at T-8 and T-25 have been inactive since March 2010 and should be removed from this table.

Page 6, Table 1: The Special Purpose Monitors at T-4 and T-23 are currently being relocated on the Owens playa. It is our understanding that GBUAPCD has selected new locations for the monitors, and has solicited help from LADWP in moving them. GBUAPCD should include the new locations in this plan for public review and comment. Otherwise, the stations will be installed and collecting data before they have been formally reviewed and approved.

Page 6, Table 1: The Flat Rock TEOM was decommissioned in May 2011. As a result, the Flat Rock monitor should either be removed from the table, or the table revised to show that meteorological data only are collected at this site.

Page 6, Table 1: The 2012 Network Plan should remove all reference to the Simis Residence monitor. The Simis Residence PM_{10} monitor was decommissioned in August 2008, and the meteorological monitoring was suspended in July 2011. No monitoring at this location is planned for 2012.

Page 8, "Core-Based Statistical Area": This phrase appears nowhere else in the document and should be removed from this list of definitions.

Page 8, "Micropolitan Statistical Area": This phrase appears nowhere else in the document and should be removed from this list of definitions.

Page 9, "Population Exposure": This phrase appears nowhere else in the document and should be removed from this list of definitions.

Page 9, "Representative Concentration": This phrase appears nowhere else in the document and should be removed from this list of definitions.

Page 9, "Trend Analysis": This phrase appears nowhere else in the document and should be removed from this list of definitions.

Page 9, "Site Comparison": This phrase appears nowhere else in the document and should be removed from this list of definitions.

Page 11, Dust Identification Program, lines 1-4: The text identifies special purpose monitors at T-4 and T-23 but doesn't mention that the monitoring stations are being moved, or where. It is LADWP's understanding that the GBUAPCD has selected new locations, and that the moves are underway now. If true, the GBUAPCD should be required to disclose this information in the 2012 Network Plan for public review and comment prior to acceptance of any data collected at the new locations.

Page 13, Mono Lake: This paragraph contains outdated information about the Simis Residence monitor, which was discontinued in August 2008. The out-of-date information should be removed from this paragraph.

Page 13, Mono Lake, lines 12-13: The statement "*This network is used to provide information on what portion(s) of the exposed shoreline are emissive and to what extent during a given storm*" is a gross overstatement. The system can only be used (and even then with a high degree of uncertainty) to identify emissive areas within the enclosed area of the 25 Sensits shown on the lower right side of Figure 5. The lineal extent of the Mono Lake shoreline within this Sensit network is roughly only 4 percent of the total.

Page 14, 5.0 Recent or Proposed Modifications to Network, Owens Lake: This paragraph again mentions the inactive Special Purpose Monitors at T-8 and T-25. Both have been inactive for many years and therefore should be removed from the 2012 Network Plan. In addition, this paragraph mentions that the Special Purpose Monitors at T-4 and T-23 are being moved by "mid-2012," but doesn't mention where or why. Again, it is LADWP's understanding that the GBUAPCD has selected new locations and is moving the stations right now. If this is true, the GBUAPCD should be required to disclose this information in 2012 Network Plan for public review and comment prior to acceptance of any data collected at the new locations.

Page 16, 6.0 Minimum Monitoring Requirements, PM_{10}: The tabulated data in this section indicate that there are 12 active monitors in the Owens Lake non-attainment area. By LADWP's count, there are only 11 monitors proposed for 2012.

Page 23, NCORE Plan, Quality Assurance Status: This paragraph implies that the GBUAPCD has its own quality assurance plans when it states: "*The District's current Quality Assurance Project Plans...*" To our knowledge, the GBUAPCD does not have its own approved PM_{10} QAPP and so that statement should be clarified. The EPA seems to believe that the GBUAPCD has its own independent QAPP because of the statements made in their 2008 technical systems audit of the California ARB air quality network:[4]

[4] Technical Systems Audit of the California ARB, 2007, Conducted by the US EPA Region 9

- "During the audit, EPA received a copy of GBUAPCD's most recent PM10 QAPP which will be reviewed for approval by Region 9."
- "Finding GB1: Great Basin operates an independent monitoring, laboratory and QA program from that of ARB."
- "Discussion GB1: GBUAPCD has independent QAPPs for its PM2.5 and PM10 monitoring programs and laboratory operations. The QAPPs incorporate SOPs written by the District. QA oversight by ARB consists of a flow audit once per year."

The 2012 Network Plan should clarify the nature and approval status of the District's PM_{10} and $PM_{2.5}$ QAPPs.

5. Conclusion.

LADWP believes that these concerns, unless properly addressed, greatly undermine the value of the GBUAPCD's monitoring network and the associated data collected. Therefore, LADWP requests that these issues be addressed prior to approval of the 2012 Network Plan.

If you have any questions, please contact me at (213) 367-1138, or Mr. Nelson Mejia of my staff at (213) 367-1043.

Sincerely,

William T. Van Wagoner
Manager of Owens Lake Regulatory
Issues and Future Planning

WTVW:rdn

c: Mr. Matthew Lakin, United States Environmental Protection Agency
Mr. Larry Biland, United States Environmental Protection Agency
Mr. Michael Flagg, United States Environmental Protection Agency
Ms. Sylvia Oey, California Air Resources Board
Mr. Mark Schaaf, Air Sciences Inc.
Mr. Chris Jakober
Mr. Nelson Mejia

Enclosure 2

Department of Water and Power the City of Los Angeles

September 28, 2012

Matthew Lakin, Ph.D.
U.S. Environmental Protection Agency, Region 9
75 Hawthorne Street, AIR-6
San Francisco, CA 94105

Subject: Los Angeles Department of Water and Power Comments on Great Basin Unified Air Pollution Control District 2012 Ambient Air Monitoring Network Plan

Dear Dr. Lakin:

This letter responds to Great Basin Unified Air Pollution Control District's (GBUAPCD) request that U. S. Environmental Protection Agency (EPA) approve its 2012 Ambient Air Monitoring Network Plan (2012 Network Plan). The 2012 Network Plan cannot be approved by EPA, because among other defects, GBUAPCD's PM_{10} and $PM_{2.5}$ Quality Assurance Project Plans (QAPP) have not been approved by EPA in accordance with 40 C.F.R. 58 Appendix A. This regulation requires that "*All monitoring organizations must develop a quality system that is described and approved in quality management plans (QMP) and quality assurance project plans (QAPP)*. . . ." (40 C.F.R. 58 Appendix A, § 2.1.) The fact that GBUAPCD is operating its monitoring network without a set of approved QAPPs is deplorable considering that this unverified data is being used to impose requirements upon the Los Angeles Department of Water and Power (LADWP) at significant public expense, and serves as the basis for determining the ultimate attainment status of the Owens Valley Planning Area (OVPA).

EPA is well aware of this serious problem with GBUAPCD's 2012 Network Plan. LADWP brought this issue to EPA's attention by its letter dated October 13, 2011. Instead of requiring GBUAPCD to comply with the law, EPA approved the 2011 Ambient Air Monitoring Network Plan. When GBUAPCD considered the 2012 Network Plan, LADWP again pointed out that the failure to approve the QAPPs violated the law. Again, GBUAPCD approved the 2012 Network Plan without approving any QAAPs. It is absurd that GBUAPCD's refusal to change the 2012 Network Plan to comply with the law means EPA will not provide a formal opportunity for public comment on this network plan.

EPA must ensure GBUAPCD complies with applicable regulations to collect and analyze data in accordance with recognized and approved quality assurance procedures. GBUPACD should be required to consider and approve adequate QAPPs in a public proceeding in order to ensure the quality, accuracy, and integrity of the data moving forward. Until this happens, any data collected pursuant to these defective Ambient Air Monitoring Network Plans must be disregarded, and the data cannot be used for determining the attainment status of the OVPA and/or to impose air quality mitigation obligations upon LADWP.

Below are LADWP's original comments on the 2012 Network Plan, with additional responses to the comments made in GBUAPCD's May 23, 2012, staff report. LADWP urges EPA to disapprove the 2012 Network Plan until it complies with the law.

1. Background

In June 2012, Mr. Theodore Shade, Air Pollution Control Officer (APCO) for GBUAPCD, submitted to EPA its 2012 Network Plan dated April 20, 2012, including, in Appendix B, the proposed network plan for the National Core (NCORE) monitoring station located at the White Mountain Research Station, east of Bishop, California. The GBUAPCD Board of Governors approved the 2012 Network Plan May 24, 2012. LADWP reviewed the 2012 Network Plan and had a number of questions and concerns regarding the proposed network and monitoring approach advocated by GBUAPCD, including the proposed NCORE plan. LADWP submitted these questions and concerns in a comment letter to the GBUAPCD Board on May 16, 2012. However, in the staff report for the May 24 GBUAPCD Board meeting – prepared less than two days after GBUAPCD received LADWP's May 16 letter – GBUAPCD staff either ignored or outright rejected all of LADWP's requests and suggestions on the 2012 Network Plan. The short review period within which GBUAPCD staff drafted the report and issued their recommendation to the GBUAPCD Board raises serious questions about whether LADWP's comments were given adequate consideration by the APCO and GBUAPCD staff prior to the 2012 Network Plan being submitted to the GBUAPCD Board for approval, and then to EPA for ultimate approval.

2. GBUAPCD Quality Assurance Project Plans

As noted above, LADWP is concerned that GBUAPCD has been operating its PM_{10} and $PM_{2.5}$ network in the Owens Valley without EPA-approved QAPPs. Title 40 Code of Federal Regulations (CFR) Part 58 Appendix A requires, among other things, that "*All monitoring organizations must develop a quality system that is described and approved in quality management plans (QMP) and quality assurance project plans (QAPP)*..." (40 C.F.R. 58 Appendix A, § 2.1). On September 8, 2011, LADWP requested copies of the GBUAPCD PM_{10} and $PM_{2.5}$ QAPPs. The PM_{10} and $PM_{2.5}$ QAPPs were received from

GBUAPCD on September 22, 2011, and September 27, 2011, respectively. Both QAPPs were unsigned, designated as "drafts" (dated March 2001 and November 2002, respectively), and presumably, never approved by EPA.

In later correspondence related to LADWP's appeal of GBUAPCD's 2011 Supplemental Control Requirement Determination (2011 SCRD) to the California Air Resources Board (ARB),[1] attorneys for GBUAPCD argued that GBUAPCD and other districts have approved QAPPs under the ARB, and that ARB has obtained EPA's approval for the QAPPs. However, the ARB Quality Assurance Plan (QAP)[2] referenced in the GBUAPCD brief does not fulfill the quality assurance project plan requirements in 40 C.F.R. 58 because it does not address all the unique instrument systems and processes that generate the data used to identify supplemental control areas on Owens Lake, nor does it address GBUAPCD's monitoring organization, among other omissions. Some of those missing system elements (*e.g.*, sand motion monitoring, video monitoring) are described on page 11 of the 2012 Network Plan's section entitled "Dust Identification Program." To be clear, although the ARB QAP encompasses the SLAMS network that is the subject of the 2012 Network Plan, it does not cover the *use* of this data to identify supplemental dust control areas on Owens Lake because it does not properly assure quality for all the instrument systems that are used in the dust source identification process described in the 2008 GBUAPCD Owens Valley State Implementation Plan (2008 SIP).

LADWP requested that GBUAPCD update its PM_{10} and $PM_{2.5}$ QAPPs, encompassing all of the instrument systems that are required to implement the procedures described in the 2008 SIP, including the monitoring organization structure and functions, and to have them approved in a public proceeding in order to ensure that the data are being collected and analyzed in accordance with recognized quality assurance procedures. LADWP also requested that GBUAPCD complete this work expeditiously, as the monitoring network is active and currently being used to identify emissive sources on Owens Lake and the Keeler Dunes, evaluate compliance within the OVPA, and to assess the contributions from Owens Lake as far away as the Coso Junction Maintenance Area.

In response to LADWP's comments above regarding the lack of approved QAPPs, GBUAPCD asserted in its May 23, 2012, staff report that: "*...it is not the LADWP's*

1 GBUAPCD's Opposition Brief Regarding the 2011 SCRD Appeal, State of California Air Resources Board, dated April 19, 2012.

2 The ARB QAP was designed primarily as a guidance document for the operation of quality assurance programs used by the ARB, local air districts, and industry, whereas a QAPP is a more detailed plan that describes the quality assurance procedures for a particular project.

place to determine the validity of the ARB or District's QAPP," and that "*...these documents are scheduled for revision during the 2012 calendar year.*" First, LADWP's comments were submitted as part of the public review period. Second, it is very much LADWP's business to question the content and validity of GBUAPCD's QAPPs. GBUAPCD's monitoring network has been operating on the Owens playa for over 10 years, and the data collected from the network have led to the identification, design, and implementation of over 40 square miles of dust controls on the playa, at a cost of well over $1 billion dollars. LADWP and the nearly 4-million citizens it serves have every right to expect that the agency responsible for ordering dust controls in the OVPA – GBUAPCD – is in compliance with all federal rules governing the collection and quality assurance of data used in the decision making process. GBUAPCD has been negligent in these duties for more than 10 years. Moreover, even if the PM_{10} QAPP is eventually approved in 2012 as GBUAPCD contends, it is far too little too late for LADWP and its ratepayers. EPA and ARB share proportional responsibility for allowing GBUAPCD's breach of these obligations to continue for so long and at such great expense to LADWP.

3. Overall Monitoring Network Design

GBUAPCD's network of source impact monitors is focused almost entirely on Owens Lake. This is problematic because the current network does not adequately assess the contributions from other off-lake source areas that also affect air quality within the OVPA, an area much larger that encompasses much more than simply Owens Lake.

Of the 18 monitors listed in the draft 2012 Network Plan, 11 are designated as "source impact" monitors, and *all* of these source impact monitors are located on or immediately around Owens Lake and the Keeler Dunes. Given the fact that high PM_{10} concentrations originate from off-lake sources upwind and downwind of Owens Lake, GBUAPCD should extend its network to encompass some of these source areas, which affect local communities as well as the overall attainment status of the OVPA. LADWP has provided abundant evidence to GBUAPCD over the years that high PM_{10} concentrations originate outside of Owens Lake. LADWP requested that GBUAPCD identify the major off-lake source areas (including the Olancha Dunes and the string of ancient dry riverbeds just north of Owens Lake along the eastern side of the valley) and to monitor them for both sand motion and dust emissions. This information would have assisted GBUAPCD in their recent assessment of the contribution of Owens Lake dust emissions at the Coso Junction PM_{10} monitor, located 18 miles south of Owens Lake. GBUAPCD's modeling analysis did not include any off-lake dust sources because the information required to characterize those sources is not being collected by GBUAPCD. If GBUAPCD is truly interested in understanding the sources of dust that are affecting the Coso Junction monitor, then it should expand its source-impact monitoring network beyond Owens Lake.

The Owens Lake network described on page 10 of the 2012 Network Plan states that: "*An additional monitor is located 20 miles south of the lake at Coso Junction.*" It is questionable how a single monitor, located some 20 miles south of Owens Lake with large off-lake sources in between, can be considered an adequate part of the Owens Lake network. LADWP requested that GBUAPCD either explain its reasoning more thoroughly or remove this statement from the 2012 Network Plan; however, GBUAPCD failed and refused to do so.

GBUAPCD also took issue with LADWP's statement that: "*high PM_{10} concentrations originate from sources upwind and downwind of Owens Lake.*" GBUAPCD abruptly dismissed LADWP's concerns, stating that: "*LADWP offers no scientifically defensible data to prove this assertion.*" GBUAPCD's response is preposterous and untenable, and ignores GBUAPCD's own data. LADWP has provided abundant evidence of the importance off-lake sources within the Owens Valley, most of this extracted from the District's own record. Evidence was submitted as part of, among other things, LADWP's 2005 Alternatives Analysis, 2008-2010 Owens Lake Expert Panel proceedings, 2011 Alternatives Analysis, and in numerous letters sent to both EPA and GBUAPCD regarding the influence of off-lake sources on the Owens Lake and Coso Junction monitors. GBUAPCD's curt response proves LADWP's point that GBUAPCD is failing to adequately investigate off-lake sources.

In providing its own "proof" that large, off-lake sources are non-existent between Owens Lake and Coso Junction, GBUPACD states: "*District staff regularly visually monitors the area between Owens Lake and Coso Junction and has never identified any 'large off-lake sources.'*" This is not entirely accurate. As GBUAPCD knows, the Olancha Dunes are located between Owens Lake and Coso Junction, and these natural dunes are frequently and, at times, highly, emissive. Many other known or suspected dust source areas are located between Owens Lake and Coso Junction, including a large expanse of seasonally dry ponds near the Olancha refuse transfer station, and two large and mostly barren fields located between one and four miles north of the Coso Junction monitor. LADWP pointed out these sources and their possible influence on the Coso Junction monitor in a March 15, 2012, letter to EPA, which was copied to GBUAPCD.

Finally, GBUAPCD stated that: "*Air quality data indicate that total annual PM_{10} contributions from offlake [sic] sources are a very small percentage of the PM10 emissions. The Board approved emission inventory in the 2008 SIP confirms this fact.*" First, Board approval of an emission inventory is not evidence that the inventory is correct or complete. Second, LADWP has conducted its own assessment showing that GBUAPCD has, through a combination of errors and omissions in the 2008 SIP, underreported the off-lake PM_{10} emissions within the OVPA by as much as 74,000 tons of PM_{10} per year. GBUAPCD has this information which was submitted as part of LADWP's appeal to ARB of the 2011 SCRD.

4. Comments on Individual Monitors

A. Keeler PM_{10} and $PM_{2.5}$ Monitors

Keeler $PM_{2.5}$ and PM_{10} monitors appear to violate EPA's siting criteria contained in 40 C.F.R. 58 Appendix E. Under 40 C.F.R. Part 58, Appendix E, 3. Spacing from Minor Sources: "The plume from the local minor sources should not be allowed to inappropriately impact the air quality data collected at a site. Particulate matter sites should not be located in an unpaved area unless there is vegetative ground cover year round, so that the impact of wind blown dusts will be kept to a minimum." Keeler monitors are located atop the GBUAPCD laboratory building near the center of town, which is surrounded by a network of unpaved streets and roadways that can be dusty under high winds with no traffic. The old State Highway leading south out of Keeler is particularly emissive because the old asphalt is seriously degraded and sand covers many parts of the roadway. This old road continues to be used as a shortcut to Highway 136 and dust plumes generated by passing vehicles have been observed to cross the Keeler PM_{10} monitor under southerly winds. Moving the monitor to the north edge of town would eliminate some of these local influences and provide a more representative sample of the air quality arriving from sources located outside of town. LADWP requested that, at a minimum, GBUAPCD consider paving the road that runs along the east side of their laboratory facility (the west side is paved) because that road is still open and actively used.

GBUAPCD responded to LADWP's comment by stating that: "*they [LADWP] offer no scientific evidence of the extent of the alleged influence*" from unpaved roads. GBUAPCD also stated that LADWP had misread EPA's siting criteria in Title 40 C.F.R. Part 58 Appendix E, Section 6.3(b), which states that: "*The intent is to locate localized hot-spot sites in areas of highest concentrations whether it be from mobile or multiple stationary sources.*"

It is GBUAPCD's – not LADWP's – responsibility to ensure its monitors comply with EPA's requirements. The facts that the monitor is surrounded by a network of ***unpaved*** streets and roadways, and that LADWP has observed that dust plumes generated by passing vehicles cross the Keeler PM_{10} monitor is sufficient to show that the monitor location violates EPA's siting requirements. Furthermore, regardless of whether there is proof of impact or not, it is still GBUAPCD's responsibility to adhere to EPA's siting criteria.

With respect to GBUAPCD's statement that LADWP misread the siting criteria, the purpose of the Keeler monitor is to record emissions from Owens Lake, not to monitor the influence of nearby mobile or stationary sources. If the Keeler monitor is to be used to calculate Owens Lake K-factors (emission rates), or to evaluate the PM_{10} concentrations attributable to Owens Lake, then GBUAPCD must first subtract the influence from these localized, non Owens Lake sources. The responsibility for this action lies with GBUAPCD, not with LADWP. As suggested above, GBUAPCD would be better served by siting the station away from heavily travelled unpaved roads.

B. North Beach PM_{10} Monitor

The North Beach PM_{10} monitor also appears to violate EPA siting criteria contained in 40 C.F.R. 58 Appendix E. The location of the North Beach monitor is especially problematic because it is located adjacent to two heavily used unpaved roads: a north-south gravel haul road leading to the Zone 1 shallow flood areas, and the (very dusty) east-west Boulder Creek Road used for local access.

GBUAPCD responded by claiming that: "*The District is solely responsible for siting..*"; that "*The North Beach monitor was a compromise..*"; that ARB and EPA have both audited this site, and that "*No adverse comments about station siting have ever been made.*" None of these comments address LADWP's concerns that the North Beach station is poorly sited because it is located adjacent to two heavily used, unpaved haul roads. LADWP renews its request that this station be relocated to a more suitable location that is not so greatly influenced by local dust sources.

C. Flat Rock PM_{10} Monitor

The 2012 Network Plan states that during April 2011, the PM_{10} monitor at Flat Rock was shut down and moved northeast to the Mill Site (page 10, last paragraph). No reason was given why the Flat Rock station was discontinued, or why the Mill Site was chosen. It is important to know why these changes were made. Both LADWP and GBUAPCD have evidence that the Flat Rock monitor was recording emissions from an off-lake source area located between the monitor and the regulatory shoreline. These emissions could have been the reason for the move. However, the Flat Rock dune area is just one of several off-lake source areas that are known to affect shoreline monitors under certain meteorological conditions. LADWP stated that GBUAPCD *should* be monitoring the emission contribution from known off-lake sources, and that the removal of the Flat Rock dunes monitor appears to be another example of GBUAPCD's desire to disregard the emission contributions of off-lake dust sources. Moreover, off-lake source areas also influence the Mill Site. Screening for on-lake wind directions cannot remove the influences of off-lake sources.

GBUAPCD responded by claiming that these were "*accusation[s] against the District with no scientific evidence provided to defend it.* GBUAPCD already has scientific evidence supporting LADWP's concerns. Both GBUAPCD and LADWP are well aware of the influence of the Flat Rock dunes and surrounding desert due to the fact that a sand-motion monitoring device was installed there in October 2008 at LADWP's insistence. A significant amount of sand motion was recorded at that location which confused the signal from Owens Lake, but also provided evidence of a relatively large off-lake dust source.

LADWP reiterates its comment that the 2012 Network Plan should explain why the Flat Rock monitor was discontinued, and why the Mill Site was selected. Regarding the latter comment, it is very important for the 2012 Network Plan to address the possible influences from nearby, off-lake dust sources. At the very least, GBUAPCD should install a sand-motion monitoring device at the Mill Site (as was true at Flat Rock) in order to verify whether and to what extent off-lake sources are influencing the recorded concentrations.

D. Coso Junction PM_{10} Monitor

GBUAPCD improperly utilizes data from the Coso Junction PM_{10} monitor to assess the contributions from Owens Lake. This is improper because (1) the Dust ID model has very poor predictive capability, even at the relatively short plume transport distances across Owens Lake; (2) the Dust ID modeling protocol described in the 2008 SIP does not address the unique surface and meteorological conditions that prevail over the long transport distances between Owens Lake and the Coso Junction Maintenance Area (CJMA); and (3) the Dust ID model does not include any of the several known off-lake source areas that influence downwind dust concentrations, and which are therefore critical for apportioning the PM_{10} concentrations arriving at the Coso Junction monitor. Some, but not all of these non-Owens Lake dust sources, were documented in a letter to the EPA dated March 15, 2012, a copy of which was also sent to GBUAPCD.

GBUAPCD responded that (regarding the March 15, 2012, report): "*These assertions have no scientific merit. The 'dust sources' that were documented in LADWP's letter of March 15, 2012, contain no data whatsoever and have only pictures of 'sources' that are encrusted and not emissive. There is a difference between a scientifically defensible argument and a few pictures that show non-emissive surfaces. Many of the areas pictured in LADWP's letter were visited by District staff and found to have a competent crust that would not become emissive in a wind event.*"

The purpose of LADWP's March 15, 2012, letter was to notify both EPA and GBUAPCD that there are dust sources located nearby and immediately upwind of the Coso Junction monitor that could be influencing the dust concentrations there, and also to point out that it is GBUAPCD's responsibility to investigate whether these sources are attributing any exceedances at the Coso Junction monitor to Owens Lake. GBUAPCD's response, that they visited the sites and found them to be non-emissive, is, to put it mildly, ludicrous. Temporal changes in surface conditions can render these areas emissive during some parts of the year and completely non-emissive during other parts of the year. The abundance of sand and sand-sized particles captured by vegetation and around fences is a testament to the fact that these areas are active during high wind events. GBUAPCD cannot dismiss these possible dust sources with one field visit. It is GBUAPCD's responsibility – not LADWP's – to investigate these potential sources before attributing the exceedances at the Coso Junction monitor to Owens Lake.

5. Specific Comments on 2012 Network Plan

A. <u>Page 6, Table 1</u>

The Special Purpose Monitors at T-8 and T-25 have been inactive since March 2010 and should be removed from this table.

GBUAPCD provided no response to this comment.

B. <u>Page 6, Table 1</u>

The Special Purpose Monitors at T-4 and T-23 are currently being relocated on the Owens playa. It is LADWP's understanding that GBUAPCD has selected new locations for the monitors, and has solicited help from LADWP in moving them. GBUAPCD should include the new locations in this plan for public review and comment. Otherwise, the stations will be installed and collecting data before they have been formally reviewed and approved.

GBUAPCD responded that: "*Changes in SPM station do not require approvals. The intent is to provide the District with the flexibility to install and operate monitors for short-term studies and to move them as deemed necessary by District staff.*" LADWP does not understand GBUAPCD's reluctance to solicit public input. GBUAPCD's actions affect LADWP and its ratepayers. The monitors at T-4 and T-23 were installed at those locations with LADWP's approval, and for the sole purpose of providing more refined K-factors on the playa. GBUAPCD should be willing to provide LADWP with sufficient information to understand where the stations might be moved and why, and this information should be disclosed in the annual plan that is open for public review and comment.

C. Page 6, Table 1

The Flat Rock TEOM was decommissioned in May 2011. As a result, the Flat Rock monitor should either be removed from the table, or the table revised to show that meteorological data only are collected at this site.

GBUAPCD provided no response to this comment.

D. Page 6, Table 1

The 2012 Network Plan should remove all reference to the Simis Residence monitor. Simis Residence PM_{10} monitor was decommissioned in August 2008, and the meteorological monitoring was suspended in July 2011. No monitoring at this location is planned for 2012.

GBUAPCD provided no response to this comment.

E. Page 8, "Core-Based Statistical Area"

This phrase appears nowhere else in the document and should be removed from this list of definitions.

GBUAPCD provided no response to this comment.

F. Page 8, "Micropolitan Statistical Area"

This phrase appears nowhere else in the document and should be removed from this list of definitions.

GBUAPCD provided no response to this comment.

G. Page 9, "Population Exposure"

This phrase appears nowhere else in the document and should be removed from this list of definitions.

GBUAPCD provided no response to this comment.

H. Page 9, "Representative Concentration"

This phrase appears nowhere else in the document and should be removed from this list of definitions.

GBUAPCD provided no response to this comment.

I. Page 9, "Trend Analysis"

This phrase appears nowhere else in the document and should be removed from this list of definitions.

GBUAPCD provided no response to this comment.

J. Page 9, "Site Comparison"

This phrase appears nowhere else in the document and should be removed from this list of definitions.

GBUAPCD provided no response to this comment.

K. Page 11, Dust Identification Program, lines 1-4

The text identifies special purpose monitors at T-4 and T-23, but fails to mention that the monitoring stations are being moved, or to what location the monitors are being relocated. It is LADWP's understanding that GBUAPCD has selected new locations, and that the monitors are in the process of being relocated. If true, GBUAPCD should be required to disclose this information in the 2012 Network Plan for public review and comment prior to acceptance of any data collected at the new locations.

GBUAPCD responded disingenuously that: "At the time of the writing of the monitoring plan locations for the special purpose monitors had not yet been finalized. Special purpose monitors require no formal review or approval," and that: "The intent is to provide the District with the flexibility to install and operate monitors for short-term studies and move them as deemed necessary by District staff." LADWP reminds GBUAPCD that the installation of special purpose monitors at T-4 and T-23 was by mutual agreement as part of a failed effort to improve the accuracy of the on-lake K-factors (they are still highly inaccurate), and moreover, that LADWP provided the TEOM instruments and shelters that were eventually used. These monitors are <u>not</u> intended to be used to show attainment under the 2008 SIP, and LADWP's consent and cooperation is contingent upon these monitors not be used for purposes of showing attainment. LADWP's consent and cooperation is required because the 2008 SIP stipulates that only shoreline monitors may be used in computing K-factors. Intended locations and uses must be disclosed in the 2012 Network Plan. If GBUAPCD does not provide the requested information, LADWP will withdraw its agreement and protest the use of any on-lake TEOM data on grounds that it violates the 2008 SIP.

L. Page 13, Mono Lake

This paragraph contains outdated information about the Simis Residence monitor, which was discontinued in August 2008. The out-of-date information should be removed from this paragraph.

GBUAPCD provided no response to this comment.

M. Page 13, Mono Lake, lines 12-13

The statement "*This network is used to provide information on what portion(s) of the exposed shoreline are emissive and to what extent during a given storm*" is a gross overstatement and therefore misleading. The system can only be used (and even then with a high degree of uncertainty) to identify emissive areas within the enclosed area of the 25 Sensits shown on the lower right side of Figure 5. The lineal extent of the Mono Lake shoreline within this Sensit network is roughly only 4 percent of the total.

GBUAPCD provided no response to this comment.

N. Page 14, 5.0 Recent or Proposed Modifications to Network, Owens Lake

This paragraph again mentions the inactive Special Purpose Monitors at T-8 and T-25. Both have been inactive for many years and therefore should be removed from the 2012 Network Plan. In addition, this paragraph mentions that the Special Purpose Monitors at T-4 and T-23 are being moved by "mid-2012," but doesn't mention where or why the monitors are being relocated. LADWP understands that GBUAPCD has selected new locations and is currently moving the stations. If this is true, then GBUAPCD should be required to disclose this information in the 2012 Network Plan for public review and comment prior to acceptance of any data collected at the new locations.

GBUAPCD's response to this comment is addressed in Item K.

O. Page 16, 6.0 Minimum Monitoring Requirements, PM_{10}

The tabulated data in this section indicates that there are 12 active monitors in the Owens Lake non-attainment area. By LADWP's count, there are only 11 monitors proposed for 2012.

GBUAPCD provided no response to this comment.

P. Page 23, Quality Assurance Status

This paragraph implies that GBUAPCD has approved QAPPs when it states: "*The District's current Quality Assurance Project Plans...*" As previously discussed, GBUAPCD does not have its own approved PM_{10} QAPP. This statement must be corrected, to avoid further misunderstandings. For example, EPA appears to have been misled in its 2008 technical systems audit of the California ARB air quality network that GBUAPCD has its own independent QAPP based upon several statements EPA made, including the following:[3]

- "During the audit, EPA received a copy of GBUAPCD's most recent PM10 QAPP which will be reviewed for approval by Region 9."
- "Finding GB1: Great Basin operates an independent monitoring, laboratory and QA program from that of ARB."
- "Discussion GB1: GBUAPCD has independent QAPPs for its PM2.5 and PM10 monitoring programs and laboratory operations. The QAPPs incorporate SOPs written by the District. QA oversight by ARB consists of a flow audit once per year."

These statements are not correct, and contradict GBUAPCD's representation to ARB that it operates under ARB QAPPs. The 2012 Network Plan should clarify that GBUAPCD does not have approved PM_{10} and $PM_{2.5}$ QAPPs.

GBUAPCD provided no responses to these comments.

The specific issues and concerns outlined above, unless properly addressed, greatly undermine the credibility of GBUAPCD's monitoring network and the associated data collected pursuant to this network. These issues must be addressed prior to EPA approval of the 2012 Network Plan. In addition, GBUPACD should be required to update both QAPPs and consider them in a public proceeding in order to ensure the

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[3] Technical Systems Audit of the California ARB, 2007, conducted by the EPA Region 9.

quality, accuracy, and integrity of the data moving forward. Until this happens, all data, including all data to date, must be disregarded and cannot be utilized to determine the attainment status of the OVPA.

We appreciate EPA's consideration of these requests. Please contact me at (213) 367-1014 or Mr. William T. VanWagoner, Manager of Owens Lake Regulatory Issues and Future Planning, at (213) 367-1138 if you have any questions.

Sincerely,

Martin L. Adams
Director of Water Operations

WTVW:vf
c: William T. VanWagoner

Enclosure 3

Department of Water and Power | the City of Los Angeles

January 8, 2013

Matthew Lakin, Ph.D.
U.S. Environmental Protection Agency, Region 9
75 Hawthorne Street, AIR-6
San Francisco, CA 94105

Dear Dr. Lakin;

Subject: Los Angeles Department of Water and Power's Supplemental Comments on the Great Basin Unified Air Pollution Control District 2012 Ambient Air Monitoring Network Plan

This letter further supplements the comments submitted by the City of Los Angeles Department of Water and Power (LADWP) on September 28, 2012, in response to the Great Basin Unified Air Pollution Control District's (District) request that the U.S. Environmental Protection Agency (EPA) approve its 2012 Ambient Air Monitoring Network Plan (2012 Network Plan). LADWP understands that EPA is still completing its review of the 2012 Network Plan and, therefore, has not yet taken any formal action on the plan. In addition to the reasons stated in LADWP's September 28, 2012, comment letter, EPA cannot approve the 2012 Network Plan because it includes monitors that are no longer part of the District's network of air quality monitoring facilities as of December 29, 2012. EPA has no authority to approve the 2012 Network Plan when it is based upon District monitoring stations that no longer exist.

LADWP has entered into several license agreements granting the District permission to access lands owned by the City of Los Angeles (City) in order to construct, operate, and maintain various air monitoring facilities and equipment. A number of these facilities and equipment are identified in the 2012 Network Plan, including the District's air monitoring stations informally referred to as the Dirty Socks Monitor, Mill Site Monitor, and North Beach Monitor. (See 2012 Network Plan, p. 4, Figure 2.) On November 29, 2012, LADWP exercised its right under License Agreement No. 850 and notified the District of its intention to terminate, in part, the licenses granted by LADWP to the District to operate the Dirty Socks, Mill Site, and North Beach Monitors. A copy of the November 29, 2012, Notice of Termination is attached to this letter.

LADWP issued the Notice of Termination because the District has improperly used the data obtained from these monitors, which are identified in the Network Monitoring Plans submitted annually by the District to the EPA, including the 2012 Network Plan, to run its defective Dust

I.D. Model and to justify the issuance of numerous control orders requiring LADWP to install Best Available Control Measures (BACM) on areas surrounding Owens Lake. LADWP will not assist the District in its efforts to impose sole responsibility for controlling dust in Owens Valley on LADWP. Further, as EPA monitoring regulations require the presence of only one air quality monitor within the Owens Valley Planning Area (OVPA), the Dirty Socks, Mill Site and North Beach Monitors are not necessary to ensure compliance with any existing legal or regulatory requirements. The District was required to vacate and discontinue use of the Dirty Socks, Mill Site and North Beach Monitor sites by no later than December 29, 2012.

As a result of LADWP's termination of the Dirty Socks, Mill Site and North Beach Monitor licenses, the District must withdraw the current 2012 Network Plan from EPA and amend the plan to remove these monitoring stations from its designated network of facilities. Further, as discussed in LADWP's September 28, 2012, comment letter, the District must prepare an amended 2012 Network Plan and PM_{10} Quality Assurance Project Plan (QAPP), in accordance with EPA monitoring regulations; approve the 2012 Network Plan and QAPP after providing for and considering public comments; and, then resubmit the 2012 Network Plan and QAPP to EPA for review. (40 C.F.R. 58 Appendix A, § 2.1.) Until this happens, any data collected pursuant to the District's defective Ambient Air Monitoring Network Plans must be disregarded, and the data cannot be used for determining the attainment status of the Owens Valley Planning Area and/or to impose air quality mitigation obligations upon LADWP. In addition we remind EPA that to date the District has been issuing and enforcing dust control orders without an approved QAPP.

In sum, EPA cannot approve the 2012 Network Plan until it is both accurate and complies with the law.

We appreciate EPA's consideration of these requests and its diligence in closely evaluating the 2012 Network Plan. If you have any questions, please contact me at (213) 367-1014, or Mr. William VanWagoner, Manager of Owens Lake Regulatory Issues and Future Planning, at (213) 367-1138.

Sincerely,

Martin L. Adams
Director of Water Operations
Los Angeles Department of Water and Power

MLA:rdn
Enclosure
c: Mr. William T. Van Wagoner

Enclosure

Department of Water and Power the City of Los Angeles

November 29, 2012

Mr. Theodore D. Schade
Air Pollution Control Officer
Great Basin Unified Air Pollution Control District
157 Short Street
Bishop, California 93514-3537

Dear Mr. Schade:

Subject: Notice of Partial Termination of License Agreement No. 850 (LA-850)

Pursuant to LA-850, dated November 1, 2008, the Los Angeles Department of Water and Power (LADWP) granted the Great Basin Unified Air Pollution Control District (Great Basin) permission to access various lands owned by the City of Los Angeles (City) in order to construct, operate, and maintain certain air monitoring facilities and equipment. The facilities subject to LA-850 are described in Exhibits A and B of the agreement and include, among others, the following:

1. Air monitoring station (formerly subject to License Agreement No. 769), consisting of a prefabricated 8 x 8-foot cube structure (housing air monitoring equipment); a 33-foot tall meteorological tower adjacent to the cube structure; and a barbed-wire-topped 6-foot chain link fence surrounding the site on City-owned property located on Lot 2 (Inyo County Assessor's Parcel Number 29-260-05), in Section 34, Township 18 South, Range 37 East, Mt. Diablo Meridian, County of Inyo, State of California (Dirty Socks Monitor);

2. Air monitoring station (formerly subject to License Agreement No. 801) consisting of a prefabricated 8 x 8-foot equipment shed to house air monitoring equipment; a 33-foot tall meteorological tower located adjacent to the equipment shed; a 25 x 25 x 6-foot barb-wire-topped chain link fence surrounding the equipment shed; and a 915-MHz upper air-radar profiler (RASS) enclosed by a 50 x 50 x 6-foot barb-wire-topped chain link fence, which will be located adjacent to the equipment shed enclosure. The air monitoring station shall be located on City-

owned property, known as the "Mill Site," situated in the northwest quarter of Section 15, Township 17 South, Range 38 East, Mt. Diablo Meridian, County of Inyo, State of California (Mill Site Monitor); and

3. Air monitoring station located on City-owned property situated in a portion of the north half of the northeast quarter of Section 16, Township 16 South, Range 37 East, Mt. Diablo Meridian, County of Inyo, State of California (North Beach Monitor).

For several years, Great Basin has used the data obtained from these monitors, which are identified in the Network Monitoring Plans submitted annually by Great Basin to the U.S. Environmental Protection Agency (EPA), to run its Dust I.D. Model and erroneously justify the issuance of numerous control orders requiring LADWP to install Best Available Control Measures (BACM) on areas surrounding Owens Lake. LADWP will no longer allow the use of its land to support Great Basin's biased efforts to impose sole responsibility for controlling dust in the Owens Valley on it. Furthermore, as EPA monitoring regulations require the presence of only one air quality monitor within the Owens Valley Planning Area (OVPA), Dirty Socks, Mill Site, and North Beach Monitors are not necessary to ensure compliance with any existing legal or regulatory requirements.

Therefore, pursuant to paragraph 12.1 of LA-850, which provides: "Regardless of the manner or duration of use or occupancy of said licensed area by Licensee, and regardless of the permanent character of any works or structures constructed or installed therein or thereon by Licensee, this License may be terminated at any time without cause for any reason or no reason at all in the option of the Department by giving 30 days' notice of termination," LADWP hereby formally notifies Great Basin of its intent to terminate Great Basin's rights under LA-850 to access, operate, and maintain Dirty Socks, Mill Site, and North Beach Monitors. LA-850 shall remain valid and enforceable as to all other facilities subject to the license, as identified in Exhibits A and B of the agreement.

In accordance with Paragraph 12.2, Great Basin is ordered to peaceably vacate and discontinue use of Dirty Socks, Mill Site, and North Beach Monitor sites and facilities within thirty days from the date of this letter, or December 29, 2012, and to comply with all provisions of Paragraph 12 in connection with its surrender of these sites.

If you have any questions regarding this notice or LADWP's exercise of its rights under LA-850, please contact me at (213) 367-1014.

Sincerely,

Martin L. Adams
Director of Water Operations

WTV:jmm
c: Mr. Donald S. McGhie, Senior Real Estate Officer, LADWP

Department of Water and Power the City of Los Angeles

November 29, 2012

Mr. Theodore D. Schade
Air Pollution Control Officer
Great Basin Unified Air Pollution Control District
157 Short Street
Bishop, California 93514-3537

Dear Mr. Schade:

Subject: Notice of Partial Termination of License Agreement No. 850 (LA-850)

Pursuant to LA-850, dated November 1, 2008, the Los Angeles Department of Water and Power (LADWP) granted the Great Basin Unified Air Pollution Control District (Great Basin) permission to access various lands owned by the City of Los Angeles (City) in order to construct, operate, and maintain certain air monitoring facilities and equipment. The facilities subject to LA-850 are described in Exhibits A and B of the agreement and include, among others, the following:

1. Air monitoring station (formerly subject to License Agreement No. 769), consisting of a prefabricated 8 x 8-foot cube structure (housing air monitoring equipment); a 33-foot tall meteorological tower adjacent to the cube structure; and a barbed-wire-topped 6-foot chain link fence surrounding the site on City-owned property located on Lot 2 (Inyo County Assessor's Parcel Number 29-260-05), in Section 34, Township 18 South, Range 37 East, Mt. Diablo Meridian, County of Inyo, State of California (Dirty Socks Monitor);

2. Air monitoring station (formerly subject to License Agreement No. 801) consisting of a prefabricated 8 x 8-foot equipment shed to house air monitoring equipment; a 33-foot tall meteorological tower located adjacent to the equipment shed; a 25 x 25 x 6-foot barb-wire-topped chain link fence surrounding the equipment shed; and a 915-MHz upper air radar profiler (RASS) enclosed by a 50 x 50 x 6-foot barb-wire-topped chain link fence, which will be located adjacent to the equipment shed enclosure. The air monitoring station shall be located on City-

owned property, known as the "Mill Site," situated in the northwest quarter of Section 15, Township 17 South, Range 38 East, Mt. Diablo Meridian, County of Inyo, State of California (Mill Site Monitor); and

3. Air monitoring station located on City-owned property situated in a portion of the north half of the northeast quarter of Section 16, Township 16 South, Range 37 East, Mt. Diablo Meridian, County of Inyo, State of California (North Beach Monitor).

For several years, Great Basin has used the data obtained from these monitors, which are identified in the Network Monitoring Plans submitted annually by Great Basin to the U.S. Environmental Protection Agency (EPA), to run its Dust I.D. Model and erroneously justify the issuance of numerous control orders requiring LADWP to install Best Available Control Measures (BACM) on areas surrounding Owens Lake. LADWP will no longer allow the use of its land to support Great Basin's biased efforts to impose sole responsibility for controlling dust in the Owens Valley on it. Furthermore, as EPA monitoring regulations require the presence of only one air quality monitor within the Owens Valley Planning Area (OVPA), Dirty Socks, Mill Site, and North Beach Monitors are not necessary to ensure compliance with any existing legal or regulatory requirements.

Therefore, pursuant to paragraph 12.1 of LA-850, which provides: "Regardless of the manner or duration of use or occupancy of said licensed area by Licensee, and regardless of the permanent character of any works or structures constructed or installed therein or thereon by Licensee, this License may be terminated at any time without cause for any reason or no reason at all in the option of the Department by giving 30 days' notice of termination," LADWP hereby formally notifies Great Basin of its intent to terminate Great Basin's rights under LA-850 to access, operate, and maintain Dirty Socks, Mill Site, and North Beach Monitors. LA-850 shall remain valid and enforceable as to all other facilities subject to the license, as identified in Exhibits A and B of the agreement.

In accordance with Paragraph 12.2, Great Basin is ordered to peaceably vacate and discontinue use of Dirty Socks, Mill Site, and North Beach Monitor sites and facilities within thirty days from the date of this letter, or December 29, 2012, and to comply with all provisions of Paragraph 12 in connection with its surrender of these sites.

If you have any questions regarding this notice or LADWP's exercise of its rights under LA-850, please contact me at (213) 367-1014.

Sincerely,

Martin L. Adams
Director of Water Operations

WTV:jmm
c: Mr. Donald S. McGhie, Senior Real Estate Officer, LADWP

From: Lakin.Matthew@epamail.epa.gov
Subject: **Potential site closures/relocations for GBUAPCD's Dirty Socks, Mill Site, and North Beach PM10 monitoring sites**
Date: December 17, 2012 3:15:54 PM PST
To: "Ted Schade" <tschade@gbuapcd.org>
Cc: Flagg.MichaelA@epamail.epa.gov, Zimpfer.Amy@epamail.epa.gov, "Chris Lanane" <clanane@gbuapcd.org>, "Duane Ono" <dono@gbuapcd.org>

Ted,

Thank you for notifying us of LADWP's partial termination of license agreement number 850, causing GBUAPCD to vacate and discontinue the Dirty Socks, Mill Site, and North Beach PM_{10} sites by December 29, 2012. As you are aware, all three of these PM_{10} sites are designated as SLAMS and cannot be shutdown or moved without EPA approval. Also, the shutdown of these sites without EPA approval may call into question whether the area is attaining the standard and could also impact the ability of GBUAPCD to develop appropriate emissions inventories and affective control strategies.

40 CFR 58.14 outlines the required process for the discontinuance of SLAMS monitors:

- 40 CFR 58.14 (c) State, or where appropriate, local agency requests for SLAMS monitor station discontinuation, subject to the review of the Regional Administrator, will be approved if any of the following criteria are met and if the requirements of appendix D to this part, if any, continue to be met. Other requests for discontinuation may also be approved on a case-by-case basis if discontinuance does not compromise data collection needed for implementation of a NAAQS and if the requirements of appendix D to this part, if any, continue to be met.
- 40 CFR 58.14 (c)(1) Any $PM_{2.5}$, O_3, CO, PM_{10}, SO_2, Pb, or NO_2 SLAMS monitor which has shown attainment during the previous five years, that has a probability of less than 10 percent of exceeding 80 percent of the applicable NAAQS during the next three years based on the levels, trends, and variability observed in the past, and which is not specifically required by an attainment plan or maintenance plan. In a nonattainment or maintenance area, if the most recent attainment or maintenance plan adopted by the State and approved by EPA contains a contingency measure to be triggered by an air quality concentration and the monitor to be discontinued is the only SLAMS monitor operating in the nonattainment or maintenance area, the monitor may not be discontinued.
- 40 CFR 58.14 (c)(2) Any SLAMS monitor for CO, PM_{10}, SO_2, or NO_2 which has consistently measured lower concentrations than another monitor for the same pollutant in the same county (or portion of a county within a distinct attainment area, nonattainment area, or maintenance area, as applicable) during the previous five years, and which is not specifically required by an attainment plan or maintenance plan, if control measures scheduled to be implemented or discontinued during the next five years would apply to the areas around both monitors and have similar effects on measured concentrations, such that the retained monitor would remain the higher reading of the two monitors being compared.
- 40 CFR 58.14 (c)(3) For any pollutant, any SLAMS monitor in a county (or portion of a county within a distinct attainment, nonattainment, or maintenance area, as applicable) provided the monitor has not measured violations of the applicable NAAQS in the previous five years, and the approved SIP provides for a specific, reproducible approach to representing the air quality of the affected county in the absence of actual monitoring data.
- 40 CFR 58.14 (c)(4) A $PM_{2.5}$ SLAMS monitor which EPA has determined cannot be compared to the relevant NAAQS because of the siting of the monitor, in accordance with § 58.30.
- 40 CFR 58.14 (c)(5) A SLAMS monitor that is designed to measure concentrations upwind of an urban area for purposes of characterizing transport into the area and that has not recorded violations of the relevant NAAQS in the previous five years, if discontinuation of the monitor is tied to start-up of another station also characterizing transport.
- 40 CFR 58.14 (c)(6) A SLAMS monitor not eligible for removal under any of the criteria in paragraphs (c)(1) through (c)(5) of this section may be moved to a nearby location with the same scale of representation if logistical problems beyond the State's control make it impossible to continue operation at its current site.

Loss of lease generally qualifies as a logistical problem beyond the State's control, per 40 CFR 58.14 (c)(6). We would need additional information to determine whether any of the other provisions apply. If 40 CFR 58.14 (c)(6) were used as the basis for approval, the current sites must be replaced with sites of the "same scale of representation," which generally means that the replacement site must represent the same conditions and sources as the previous site. Given that each of your sites captures its own combination of sources and controls from portions of Owens Lake, this may require substantial analysis once a new site is established. Monitoring agencies generally pursue a period of parallel monitoring, where both the existing and replacement sites are operated simultaneously to establish that the new site represents the same conditions as the previous site. While this may not be possible in your case, we strongly encourage efforts to maintain the current sites until adequate replacement sites can be established, allowing time for this comparison.

We will continue to work with you and your staff on the appropriate path forward. Please let me know if you have any questions.
Matt

Matthew Lakin, Ph.D.
Manager, Air Quality Analysis Office
US EPA, Region 9 (AIR-7) | 75 Hawthorne St. | San Francisco, CA 94105
P: 415.972.3851 | E: Lakin.Matthew@epa.gov

Department of Water and Power the City of Los Angeles

ANTONIO R. VILLARAIGOSA
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RONALD O. NICHOLS
General Manager

June 17, 2013

Matthew Lakin, Ph.D.
U.S. Environmental Protection Agency, Region 9
75 Hawthorne Street, AIR-6
San Francisco, California 94105

Subject: Los Angeles Department of Water and Power Response to EPA Comments on Termination of Great Basin Unified Air Pollution Control District License Agreement for Dirty Socks, North Beach, and Mill Site SLAMS Monitors

Dear Dr. Lakin:

This letter responds to a December 17, 2012, e-mail from you to Great Basin Unified Air Pollution Control District (District) Air Pollution Control Officer, (APCO) Mr. Theodore Schade regarding the City of Los Angeles Department of Water and Power's (LADWP) partial termination of License Agreement No. 850 requiring the District to remove its three State and Local Air Monitoring Stations (SLAMS) at the Dirty Socks, North Beach, and Mill Site monitoring sites on LADWP land. The District removed the three monitors in late December 2012, in accordance with LADWP's notice of termination, and since that time has been trying to relocate them to alternative sites on property owned by the U.S. Bureau of Land Management (Bureau) (Dirty Socks and Mill Site) and the California State Lands Commission (CSLC) (North Beach Site).

The December 17 e-mail, a copy of which is enclosed as Exhibit A for reference, was included as an enclosure to a May 29, 2013, letter from the District to CSLC responding to LADWP's objections to the District's pending request to relocate its North Beach monitor onto CSLC land, and as an attachment to a May 29, 2013, letter from the District to the Bureau responding to LADWP's objections to the District's request to modify LADWP's right of way to relocate the Dirty Socks monitor. As of the date of this letter, we understand that the Bureau and CSLC have not approved the District's applications to relocate the SLAMS monitors.

LADWP objects to the District's requests on several grounds, including that the proposed relocation sites fail to comply with U.S. Environmental Protection Agency (EPA) siting criteria under 40 C.F.R. 58 Appendix E and the District's own 2008 State Implementation Plan for the Owens Valley (2008 SIP) and District Governing Board Order No. 080128-01 (Board Order). The proposed locations on Bureau and CSLC land are below the 3,600-foot regulatory shoreline elevation. The 2008 SIP and Board Order call for the use of "shoreline and near-shore PM10 monitors" for Dust ID modeling purposes as well as for evaluating compliance with the federal 24-hour PM10 standard. A "shoreline and near-shore PM10 monitor" is defined by the 2008 SIP as "...a fixed or portable USEPA-approved Federal Reference Method or Equivalent Method PM10 Monitor located approximately on the 3600-foot elevation (historic shoreline) contour, or within the Owens Valley Non-Attainment Area above the 3600-foot elevation." (2008 SIP, Ch. 8, Board Order 080128-01, Attachment B, p. 2.)

LADWP appreciates EPA's efforts to ensure that the District understands and complies with EPA regulations governing the discontinuance and relocation of such monitors. As stated in your December 17 e-mail, the District's monitoring facilities cannot be relocated without EPA approval and, even then, only where it is established that the new sites have "the same scale of representation" as the previous locations (*i.e.*, represent the same conditions and emission sources as the former sites). (40 C.F.R., § 58.14, subd. (c)(6).) Given that each of the District's SLAMS monitoring sites is unique and "captures its own combination of sources and controls," you properly instructed the District that it would need to perform a detailed analysis to determine whether the proposed relocation sites reflected sufficiently similar conditions as the former monitoring locations on LADWP land. (See Exhibit A [December 17, 2012, e-mail].)

Despite EPA's express direction and the statutory requirements of 40 C.F.R., section 58.14, the District failed to perform any comparative analysis of the proposed and former monitoring sites for the discontinued SLAMS monitors, much less the detailed analysis contemplated by EPA, before concluding that the proposed sites on BLM and CSLC land would comply with EPA regulations. Rather, the District simply assumed that relocating the monitors to sites within one kilometer or less of the previous locations – the "same neighborhood scale distance" – would be sufficient. (See Exhibit B [January 28, 2013, District letter to EPA [Deborah Jordan], p. 2.) This is not correct and is not supported anywhere in the applicable EPA regulations. In fact, the District appears to have invented its "one kilometer standard" solely for purposes of facilitating the relocation of its Dirty Socks, Mill Site, and North Beach monitors.

Also, as discussed in prior correspondence, LADWP's termination of the Dirty Socks, Mill Site, and North Beach monitor licenses invalidates the District's as-yet-unapproved 2012 Ambient Air Monitoring Network Plan (2012 Network Plan). As a result of the closure of these monitors, EPA should disapprove the 2012 Network Plan. Before EPA can consider another plan, the District must: (i) prepare a new network plan and PM10 Quality Assurance Project Plan (QAPP)[1] in accordance with EPA monitoring regulations; (ii) approve the new plan and QAPP after providing for and considering public comments; and, (iii) then resubmit the new plan and QAPP to EPA for review. (40 C.F.R., 58 Appendix A, § 2.1.) Until this happens, any data collected pursuant to the District's defective 2012 Network Plan must be disregarded, and the data cannot be used for determining the attainment status of the Owens Valley Planning Area and/or to impose air quality mitigation obligations upon LADWP. EPA cannot approve the 2012

[1] LADWP has notified EPA of its concerns about the District's failure to obtain an approved QAPP. (*See, e.g.*, October 13, 2011, letter from LADWP to EPA re: 2011 Network Monitoring Plan; May 16, 2012, letter from LADWP to EPA re: 2012 Network Monitoring Plan; January 8, 2013, letter from LADWP to EPA re: Supplemental Comments on 2012 Network Plan.)

Network Plan – or any subsequent network plan prepared by the District and submitted to EPA – until it is both accurate and complies with the law.

Finally, replacement monitors for the former Dirty Socks, Mill Site, and North Beach Monitors are not necessary to achieve attainment with the National Ambient Air Quality Standards (NAAQS) or ensure compliance with any other existing legal or regulatory requirements because EPA monitoring regulations require the presence of only one air quality monitor within the Owens Valley Planning Area (OVPA). Even without these three monitors, there are 10 monitors in the OVPA – 9 more than required. There is therefore no legitimate justification to relocate the monitors to the sites proposed by the District.

We appreciate EPA's consideration of these requests and its ongoing diligent efforts to ensure the District's compliance with EPA regulations. If you have any questions, please contact me at (213) 367-1014, or Mr. William T. Van Wagoner, Manager of Owens Lake Regulatory Issues and Future Planning, at (213) 367-1138.

Sincerely,

Martin L. Adams
Director of Water Operations

WTVW:rdn
Enclosures
c: Mr. William T. Van Wagoner

From: Lakin.Matthew@epamail.epa.gov
Subject: Potential site closures/relocations for GBUAPCD's Dirty Socks, Mill Site, and North Beach PM10 monitoring sites
Date: December 17, 2012 3:15:54 PM PST
To: "Ted Schade" <tschade@gbuapcd.org>
Cc: Flagg.MichaelA@epamail.epa.gov, Zimpler.Amy@epamail.epa.gov, "Chris Lanane" <clanane@gbuapcd.org>, "Duane Ono" <dono@gbuapcd.org>

Ted,

Thank you for notifying us of LADWP's partial termination of license agreement number 850, causing GBUAPCD to vacate and discontinue the Dirty Socks, Mill Site, and North Beach PM_{10} sites by December 29, 2012. As you are aware, all three of these PM_{10} sites are designated as SLAMS and cannot be shutdown or moved without EPA approval. Also, the shutdown of these sites without EPA approval may call into question whether the area is attaining the standard and could also impact the ability of GBUAPCD to develop appropriate emissions inventories and effective control strategies.

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- 40 CFR 58.14 (c) State, or where appropriate, local agency requests for SLAMS monitor station discontinuation, subject to the review of the Regional Administrator, will be approved if any of the following criteria are met and if the requirements of appendix D to this part, if any, continue to be met. Other requests for discontinuation may also be approved on a case-by-case basis if discontinuance does not compromise data collection needed for implementation of a NAAQS and if the requirements of appendix D to this part, if any, continue to be met.
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- 40 CFR 58.14 (c)(2) Any SLAMS monitor for CO, PM_{10}, SO_2, or NO_2 which has consistently measured lower concentrations than another monitor for the same pollutant in the same county (or portion of a county within a distinct attainment area, nonattainment area, or maintenance area, as applicable) during the previous five years, and which is not specifically required by an attainment plan or maintenance plan, if control measures scheduled to be implemented or discontinued during the next five years would apply to the areas around both monitors and have similar effects on measured concentrations, such that the retained monitor would remain the higher reading of the two monitors being compared.
- 40 CFR 58.14 (c)(3) For any pollutant, any SLAMS monitor in a county (or portion of a county within a distinct attainment, nonattainment, or maintenance area, as applicable) provided the monitor has not measured violations of the applicable NAAQS in the previous five years, and the approved SIP provides for a specific, reproducible approach to representing the air quality of the affected county in the absence of actual monitoring data.
- 40 CFR 58.14 (c)(4) A $PM_{2.5}$ SLAMS monitor which EPA has determined cannot be compared to the relevant NAAQS because of the siting of the monitor, in accordance with § 58.30.
- 40 CFR 58.14 (c)(5) A SLAMS monitor that is designed to measure concentrations upwind of an urban area for purposes of characterizing transport into the area and that has not recorded violations of the relevant NAAQS in the previous five years, if discontinuation of the monitor is tied to start-up of another station also characterizing transport.
- 40 CFR 58.14 (c)(6) A SLAMS monitor not eligible for removal under any of the criteria in paragraphs (c)(1) through (c)(5) of this section may be moved to a nearby location with the same scale of representation if logistical problems beyond the State's control make it impossible to continue operation at its current site.

Loss of lease generally qualifies as a logistical problem beyond the State's control, per 40 CFR 58.14 (c)(6). We would need additional information to determine whether any of the other provisions apply. If 40 CFR 58.14 (c)(6) were used as the basis for approval, the current sites must be replaced with sites of the "same scale of representation," which generally means that the replacement site must represent the same conditions and sources as the previous site. Given that each of your sites captures its own combination of sources and controls from portions of Owens Lake, this may require substantial analysis once a new site is established. Monitoring agencies generally pursue a period of parallel monitoring, where both the existing and replacement sites are operated simultaneously to establish that the new site represents the same conditions as the previous site. While this may not be possible in your case, we strongly encourage efforts to maintain the current sites until adequate replacement sites can be established, allowing time for this comparison.

We will continue to work with you and your staff on the appropriate path forward. Please let me know if you have any questions.
Matt

Matthew Lakin, Ph.D.
Manager, Air Quality Analysis Office
US EPA, Region 9 (AIR-7) | 75 Hawthorne St. | San Francisco, CA 94105
P: 415.972.3851 | E: Lakin.Matthew@epa.gov

Theodore D. Schade
Air Pollution Control Officer

GREAT BASIN UNIFIED AIR POLLUTION CONTROL DISTRICT
157 Short Street, Bishop, California 93514-3537
Tel: 760-872-8211 E-mail: tschade@gbuapcd.org

January 28, 2013

Ms. Deborah Jordan
US EPA Region IX (AIR-1)
75 Hawthorne Street
San Francisco, California 94105

Re: Discontinuance of SLAMS monitors at Dirty Socks, North Beach, and Mill Site

Dear Ms. Jordan:

Due to circumstances beyond the control of the Great Basin Unified Air Pollution Control District (District), last month PM_{10} monitoring was discontinued at three of the District's key monitoring sites and the monitors were removed. The discontinued sites include Dirty Socks, North Beach, and Mill Site in the Owens Valley PM_{10} nonattainment area. These monitoring sites were located on property owned by the City of Los Angeles (City) and leased to the District. As explained in the attached letter, the City terminated the District's leases at these three sites and ordered the District to remove the monitors by December 29, 2012. Because these PM_{10} sites are designated as State and Local Air Monitoring Stations (SLAMS) and are used to develop and implement effective air pollution control strategies, the District is working to re-establish monitoring at nearby locations in accordance with 40 CFR 58.14 (c)(6):

> A SLAMS monitor not eligible for removal under any of the criteria in paragraphs (c)(1) through (c)(5) of this section may be moved to a nearby location with the same scale of representation if logistical problems beyond the State's control make it impossible to continue operation at its current site.

These SLAMS monitors are not eligible for removal under 40 CFR 58.14 (c)(1) through (c)(5) because they have measured an average of between 4.4 and 19.0 PM_{10} exceedances per year since they were installed (see table below). These monitoring sites are important components of the District's Dust ID monitoring network and are integral to the implementation of the PM_{10} control strategy in the Owens Valley Planning Area. These sites are also important in the implementation of the Coso Junction PM_{10} Maintenance Plan, which has been approved by the US EPA. Ultimately, these sites will be needed to demonstrate that the area has attained the standard.

Ms. Deborah Jordan, US EPA January 28, 2013

Therefore, in accordance with 40 CFR 58.14 (c)(6), the following SLAMS sites were discontinued and will be moved as expeditiously as possible to nearby representative locations.

Site Name	AQS Site Number	Start Date	Discontinued	Years in operation	Total Number of PM_{10} Violations	Ave. Violations per Year
Mill Site	06-027-0030	May 4, 2011	Dec. 26, 2012	1.6	7	4.4
Dirty Socks	06-027-0022	Jun. 1, 1999	Dec. 19, 2012	13.6	259	19.0
North Beach	06-027-0029	Nov. 25, 2008	Dec. 26, 2012	4.1	44	10.7

The District is in the process of securing the approvals required to re-establish monitoring at nearby locations within the same neighborhood scale distance (<1 km) from the former sites. The District is proposing to relocate the sites onto public land administered by the U.S. Bureau of Land Management (Dirty Socks and Mill Site) and the California State Lands Commission (North Beach). Mainly due to electric power supply (which is provided by the City's Department of Water & Power), the total estimated cost to move these sites and to provide electrical power to the three locations is about $160,000. We will provide the coordinates for the new sites when we get permission from the land management agencies and have confirmed the location of the power drops.

Please call me or Chris Lanane at (760) 872-8211 if you have any questions regarding this matter.

Sincerely,

S.S. Peloen

Theodore D. Schade
Air Pollution Control Officer

Attachment

cc: Matthew Lakin, US EPA
Michael Flagg, US EPA
Amy Zimpfer, US EPA
Sylvia Oey, CARB
Mike Miguel, CARB
Bernadette Lovato, US BLM
Colin Connor, CSLC
Martin Adams, LADWP

Department of Water and Power the City of Los Angeles

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CHRISTINA E. NOONAN
JONATHAN PARFREY
BARBARA E. MOSCHOS, *Secretary*

RONALD O. NICHOLS
General Manager

March 22, 2013

Mr. Colin Connor, Assistant Chief
Land Management Division
California State Lands Commission
100 Howe Avenue, Suite 100-South
Sacramento, California 95825

Dear Mr. Connor:

Subject: Proposed Placement of Air Monitoring Equipment, Owens Lake, Inyo County

This letter responds to your letter dated March 8, 2013, and received by the City of Los Angeles Department of Water and Power (LADWP) on March 12, 2013, requesting LADWP to notify the California State Lands Commission (CSLC) of any objections to the proposed location of new air monitoring equipment adjacent to LADWP's leased land. As discussed below, LADWP objects to the proposed location.

The proposed location appears to be adjacent to land LADWP leases from CSLC (PRC 8079.9) for its Phase 5 dust control projects (T35 and T36) and two roads. One of the roads is a gravel road that LADWP utilizes to access its dust control projects, and the other is a dirt road known as Boulder Creek Road. The installation of an air monitor at the proposed location is incompatible with and would interfere with LADWP's present use and enjoyment of the leased lands. Specifically, the installation of an air monitor at this location would disrupt LADWP's ability to enjoy access to the Phase 5 dust control project area because traffic on the roadway would generate localized dust that would be recorded on this monitor. Based on the Great Basin Unified Air Pollution Control District's (District) recent orders, LADWP believes the District will wrongly attribute all of the dust at this monitor to Owens Lake, resulting in additional fees and dust control orders to LADWP.

In addition, installing a monitor at this location would violate U.S. Environmental Protection Agency (EPA) siting criteria contained in 40 C.F.R. 58 Appendix E. These criteria must be followed by the District "to the maximum extent possible" in order to ensure the accuracy, reliability, and integrity of the data collected from the proposed monitor by avoiding the influence of external factors such as roadways, minor emission sources, and other obstructions [40 C.F.R., App. E, §§ 1(a), (b)]. The data produced by the District's proposed monitor at this location would undoubtedly be impacted by the traffic activities on the nearby dirt and gravel roadways and, therefore, inaccurately reflect actual PM10 emissions within the area. Because the data would be improperly influenced by these sources, the District would not be able to use the data from the proposed monitor to show compliance with the National Ambient Air Quality Standards (NAAQS), or as the basis for issuing future dust control orders to LADWP. Thus, not only would the proposed monitor be incompatible with LADWP's current use of its leased lands, but it would also conflict with EPA's mandatory requirement of obtaining accurate, reliable, and *useful* air quality data from the monitor.

The proposed location of the air monitor would also violate the 2008 State Implementation Plan (SIP). The proposed location is on the Owens playa below the 3,600-foot regulatory (formerly "historic") shoreline elevation. The 2008 SIP calls for the use of "shoreline and near-shore PM10 monitors" for Dust ID modeling purposes as well as for evaluating compliance with the federal 24-hour PM10 standard. A "shoreline and near-shore PM10 monitor" is defined by the 2008 SIP as "...a fixed or portable USEPA-approved Federal Reference Method or Equivalent Method PM10 Monitor located approximately on the 3600-foot elevation (historic shoreline) contour, or within the Owens Valley Non-Attainment Area above the 3600-foot elevation." (2008 SIP, Ch. 8, Board Order 080128-01, Attachment B, p. 2). Because the proposed location of the air monitor is below the 3,600-foot elevation contour, it violates the terms of the 2008 SIP.

Also, there is no electrical power at this location. LADWP has not decided whether it will provide an easement across its leased lands for electrical power to this proposed monitor. In addition, LADWP will need to consider, among other things, the associated impacts from trenching and constructing a power line on air quality, disruption to the current gravel cover and LADWP's roadway access, and impacts to wildlife and cultural resources. In this vicinity, there are North American Badger, fox species of concern, and perch points for raptors. In addition, it is currently the breeding period for Lecontes Thrasher, Burrowing Owl, Northern Harrier, and Loggerhead Shrike. Cultural resources are also an issue. Therefore, before LADWP could agree to grant an easement, LADWP would need to comply with the California Environmental Quality Act (CEQA) that would likely necessitate extensive wildlife, habitat, and cultural surveys before the CEQA document could even be prepared. As the District knows, LADWP's resources are focused on CEQA for Phase 7a, so it may be difficult to complete a CEQA analysis for the easement project before the end of this year.

In sum, LADWP objects to the installation of an air monitor at this proposed location. If you have any questions or would like to consult with LADWP further regarding this significant issue, please contact me at (213) 367-1014, or William Van Wagoner, Manager of Owens Lake Regulatory Issues and Future Planning, at (213) 367-1138.

Sincerely,

Martin L. Adams
Director of Water Operations

WTV:jmm

c: Mr. Theodore Schade, District
Mr. Michael Flagg, U.S. EPA
Mr. William Van Wagoner, LADWP

Enclosure 8

Department of Water and Power the City of Los Angeles

July 3, 2013

Mr. Colin Connor
Assistant Chief
Land Management Division
California State Lands Commission
100 Howe Avenue, Suite 100-South
Sacramento, California 95825

Dear Mr. Connor:

Subject: The Great Basin Unified Air Pollution Control District Request for Placement and Operation of Air Monitoring Equipment, Owens Lake, Inyo County

This letter responds to your April 4, 2013, letter of non-objection to Great Basin Unified Air Pollution Control District's (District) request to place a new State and Local Air Monitoring Station (SLAMS) on Owens Lake adjacent to property leased from the California State Lands Commission (CSLC) by the City of Los Angeles Department of Water and Power (LADWP) for its Phase 5 dust control projects (T35 and T36) and two roads, as well as the District's May 29, 2013, response to LADWP's written objections to the District's SLAMS application, dated March 22, 2013.

According to your April 4 letter, CSLC does not object to the District's request to install the air monitor at the proposed location so long as the District agrees to comply with the twelve lease conditions outlined in your letter. We do not have any information about whether the District has accepted these conditions. The District's May 29 response to LADWP's objections suggests that it has not accepted the proposed lease conditions and that CSLC's approval of the District's application is still pending. (May 29, 2013, District letter, p. 3 ["District staff recommends the CSLC approve the District's request for a lease for the proposed relocation of the North Beach monitoring station to the northern shore area of the Owens Lake as specified in the District's previously submitted application."].) LADWP requests that CSLC confirm the status of its consideration of the District's application and formally notify LADWP about any future action CSLC may take with respect to the District's request.

Assuming that CSLC has not approved the District's lease application, LADWP requests CSLC to reconsider its non-objection to the proposed monitor based upon the objections asserted in LADWP's March 22 letter and for the additional reasons discussed below. CSLC should deny the District's lease application.

1. **<u>CSLC May Not Fully Appreciate The Potential Impacts of Approving the District's Lease Application.</u>**

   CSLC may not fully appreciate the potential consequences and liabilities it may incur by allowing the District to install the monitor on its property and begin collecting data. LADWP has an ever increasing body of scientific evidence that demonstrates that Los Angeles has no lawful obligation to control dust over the entire Owens lakebed. Moreover, LADWP and the District recently entered into an agreement that removes any potential liability to LADWP for dust eminating from the brine pool area.

   Under the Clean Air Act, an owner of a "source" that emits air pollutants may be held liable for monitoring and controlling emissions attributable to the source. (42 U.S.C., § 7410(a)(2)(F)(i).) As the landowner of the Owens lakebed, CSLC is the owner of this emission source and is therefore potentially liable for emissions arising from its property. The District uses information gathered from its network of monitors to project PM10 levels on the lakebed and, ultimately, assign responsibility for controlling these emissions through the issuance of dust control orders. CSLC has a significant interest in ensuring that the District's monitors are sited appropriately in accordance with United States Environmental Protection Agency (EPA) requirements so that the data collected by these monitors is, accordingly, accurate, reliable and in full compliance with the law.

   It is essential that for its own protection that CSLC consider the entire scope of dust control responsibilities instead of continuing to process District requests to access and install monitors on CSLC lands without regard to the suitability of the site locations proposed by the District and/or the potential impacts of allowing the District onto its land, as discussed below.

2. **<u>The District Provides No Evidence Showing That The Proposed Monitor Satisfies EPA's Monitor Siting Requirements.</u>**

   The District states that it "carefully assessed" the proposed site location for the SLAMS monitor and confirmed its compliance with EPA's mandatory siting criteria set forth in 40 C.F.R. 58 Appendix E, which requires the avoidance of external factors, including roadways, minor emission sources and other obstructions, that may potentially influence the data collected from the SLAMS monitor. (40 C.F.R., App. E, §§ 1(a), (b).) However, the District provides no substantive information identifying or explaining how the proposed monitor actually meets these mandatory criteria. The District's representation that it has "looked into things" and concluded that the proposed monitor satisfies EPA's requirements is legally insufficient; the law does not require CSLC or LADWP to simply take the District at its word. The District has a responsibility to make this affirmative showing and, if it cannot, then the lease application must be rejected for failing to comply with EPA regulations.

Traffic-related emissions from these roadways can and will impact the District's proposed monitor. The District admits in its May 29 letter that the nearby dirt and gravel roadways are emission sources that could impact PM10 emissions in the area and influence the accuracy, integrity and reliability of data collected by the SLAMS monitor. (May 29, 2013, District letter, p. 2 ["The presence of dirt roads is representative of sources that could impact air quality in this area."].) The District states, however, that the proposed air monitor is sufficiently far away and surrounded by a four inch gravel blanket and that it will not be affected by dust associated with traffic on these roadways. The District provides no evidence or analysis to back up its assertion. The District's statement that "there should be no significant impacts to the monitoring station" so long as LADWP maintains the access roads is not supported by any evidence. The District is willfully violating EPA's siting criteria, which are intended to ensure that monitoring data is not influenced or affected by such regulatory bias. If the District is allowed to site the proposed monitor, roadway dust will be misinterpreted for playa dust on CSLC land, which CSLC may be liable for under the Clean Air Act and District Rule 401.

Finally, the District's statement in its May 29, 2013, letter that LADWP has successfully controlled roadway dust in connection with its Phase 8 dust control project has no bearing on the potential impacts of traffic-related emissions on the District's current application to install the SLAMS monitor adjacent to LADWP's Phase 5 mitigation areas. CSLC should, accordingly, disregard this assertion.

3. **The Proposed Monitor Location Violates The 2008 SIP And Board Order No. 080128-01.**

The District states that the proposed monitor site is sufficiently "near" the Owens Lake regulatory shoreline so as to comply with the District's Governing Board Order No. 080128-01 (Board Order) and the District's 2008 State Implementation Plan for the Owens Valley Planning Area (2008 SIP). The 2008 SIP and Board Order call for the use of "shoreline and near-shore PM10 monitors" for Dust ID modeling purposes as well as for evaluating compliance with the federal 24-hour PM10 standard. A "shoreline and near-shore PM10 monitor" is defined by the 2008 SIP as "...a fixed or portable USEPA-approved Federal Reference Method or

Equivalent Method PM10 Monitor located approximately on the 3600-foot elevation (historic shoreline) contour, or within the Owens Valley Non-Attainment Area above the 3600-foot elevation." (2008 SIP, Ch. 8, Board Order 080128-01, Attachment B, p. 2.) The proposed site is below the regulatory shoreline and is more than 325 feet from the north shoreline of Owens Lake. It is therefore inconsistent with and violates the terms of the 2008 SIP and Board Order. CSLC should not authorize the lease of its property to the District where it is aware that the District's intended use of its land will violate the law.

4. **<u>The District Has Not Secured Power For The Monitoring Station.</u>**

The District needs to obtain electrical power in order to operate the SLAMS monitor at the requested location. LADWP has advised the District that it is willing to provide the power, but not until all required permits and easements are obtained from property owners, including completion of associated environmental documentation. As such, the District's statement that the issue of providing electrical power to the monitor "would not be a problem" is incorrect. Unless and until the District is able to secure a method of bringing power to the monitor site, there is no legitimate basis for CSLC to approve the District's lease application. CSLC should not authorize the District to install an air monitor that it cannot physically operate.

5. **<u>The Power Line Easement Construction Is Subject to CEQA.</u>**

The District misunderstands and misapplies the California Environmental Quality Act (Pub. Res. Code, §§ 21000, et seq.) (CEQA). Although construction and operation of the District's proposed monitor *itself* may meet the criteria for a Class 3 or Class 6 CEQA exemption (CEQA Guidelines, §§ 15303, 15306), the impacts associated with *bringing power* to the facility through trenching and constructing the necessary power line are entirely separate from the monitor-related impacts and therefore do not fall within the Class 6 (or any other) statutory CEQA exemption. LADWP has an obligation under CEQA to ensure that all environmental documentation is adequate, complete, and considers all potential environmental impacts before bringing electrical power to the proposed air monitor, including impacts to air quality and biological and cultural resources. LADWP cannot circumvent these environmental requirements in order to expedite CSLC's approval of the District's lease application.

6. **<u>The District's Proposed Site Fails to Comply With EPA's Process for the Discontinuance and Relocation of SLAMS Monitors.</u>**

The District included as an attachment to its May 29 response to LADWP's objections a copy of a December 17, 2012, e-mail from Dr. Matthew Lakin at EPA responding to notice of LADWP's termination of the District's licenses to operate its

Dirty Socks, Mill Site and North Beach air monitors. (May 29, 2013, District letter, p. 9.) As discussed in Dr. Lakin's e-mail, EPA regulations provide that an existing SLAMS monitor may be relocated to a nearby site "if logistical problems beyond the State's control make it impossible to continue operation at its current site" only where the new location has "the same scale of representation" (*i.e.*, represents the same conditions and emission sources as the previous site). (40 C.F.R., § 58.14, subd. (c)(6).) Given that each of the District's monitoring sites on Owens Lake "captures its own combination of sources and controls," EPA stated in the December 17 e-mail that "substantial analysis" would be necessary by the District to confirm that the proposed relocation site reflects sufficiently similar conditions as the prior monitoring site on LADWP land. The District, however, has provided no evidence that it performed any comparison of the proposed and former monitoring sites, much less the detailed analysis and "parallel monitoring" contemplated by EPA, before concluding that the proposed site would meet EPA's criteria for relocating its North Beach SLAMS monitor. This is a direct violation of EPA regulations and the express direction of EPA staff.

For the reasons discussed above and in LADWP's March 22 objections, CSLC should withhold approving the District's request to install the SLAMS monitor at the proposed location until such time as the CSLC is satisfied with its own potential regulatory exposure created by the proposed site and the District has met is legal obligations. If you have any questions or would like to consult with LADWP further regarding the potential significance of this issue, please contact me at (213) 367-1014, or Mr. William T. Van Wagoner, Manager of Owens Lake Regulatory Issues and Future Planning, at (213) 367-1138. Thank you for considering the concerns noted here.

Sincerely,

Martin L. Adams
Director of Water Operations

WTV:jmm/rdn
c: Mr. Theodore Schade, District
Dr. Matthew Lakin, U.S. EPA
Mr. Michael Flagg, U.S. EPA
Mr. William T. Van Wagoner

Department of Water and Power the City of Los Angeles

March 22, 2013

Ms. Bernadette N. Lovato
Field Manager
United States Department of the Interior
Bureau of Land Management
Bishop Field Office
351 Pacu Lane, Suite 100
Bishop, California 93514

Dear Ms. Lovato:

Subject: Right-of-Way CACA 50145 (Dust Control Area T5-1)

The City of Los Angeles Department of Water and Power (LADWP) holds Right-of-Way ROW CACA 50145 (ROW), enclosed for your reference, to operate a pipeline and drip irrigation system and related facilities on approximately 31 acres of United States Bureau of Land Management (Bureau) land that is located 0.3 miles southwest of Dirty Socks within LADWP's Owens Lake Dust Control Area T5-1 Addition (DCA T5-1 Addition), also known as T5-B in the Great Basin Unified Air Pollution Control District's (District) 2008 Owens Valley PM10 Planning Area State Implementation Plan (2008 SIP) and Environmental Impact Report. LADWP uses the irrigation system and facilities authorized under the ROW for the Owens Lake Dust Mitigation Project, including in DCA T5-1 Addition.

LADWP recently became aware that the District intends to relocate one of its existing air monitors to DCA T5-1 Addition. Under the stipulations enclosed as Exhibit C to the ROW agreement, LADWP may only be required to share its use of the public lands within the ROW area and/or authorize third party use of these areas in limited circumstances, specifically: (i) only where the proposed use is determined to be compatible with LADWP's use of the ROW for dust mitigation purposes, and (ii) only after consultation with LADWP (see ROW, Exhibit C, Stipulation Nos. 2 and 3). LADWP objects to the District's proposed relocation of the monitor because it interferes with LADWP's use of the ROW for dust mitigation in DCA T5-1 Addition and adjacent areas, as discussed below. LADWP expects that the Bureau will consult with LADWP, as it is required to do before responding to any request by the District to relocate the monitor within the ROW.

The installation of an air monitor within DCA T5-1 Addition, an active dust control area, is incompatible with LADWP's present use of the ROW lands, specifically the irrigation system and for ongoing dust control operations, for several reasons. Installing an air monitor would disrupt LADWP's ability to implement dust controls within the ROW area because the proposed access road and construction of the pad and surrounding fence enclosure for the monitor could cut across or come close to existing drip-irrigation lines, which could require relocation of the lines. Furthermore, construction activities and traffic would likely generate additional dust emissions in T5-1 Addition, which is already under a District Board Order to reduce dust emissions. Installation of the monitor in the T5-1 Addition would undermine the effectiveness of the dust controls there, making it more difficult to achieve compliance with the PM10 standards, ultimately negating the effectiveness of these controls and, as a result, negate the greater benefit to the public of reduced PM10 emissions resulting from LADWP's dust control efforts. These public benefits were a significant factor in the Bureau's decision to grant the ROW to LADWP and to waive the associated rental payment requirement (ROW, page 4.) A third party use of the ROW that conflicts so directly with LADWP's irrigation system and ongoing dust mitigation activities cannot reasonably be considered "compatible" with LADWP's legally authorized and publicly beneficial use of the ROW lands. Therefore, in accordance with Exhibit C to the ROW, the Bureau cannot approve the District's request to install the proposed air monitor.

In addition, the proposed location of the air monitor is on the Owens playa below the 3,600-foot regulatory (formerly "historic") shoreline elevation. The 2008 SIP calls for the use of "shoreline and near-shore PM10 monitors" for Dust ID modeling purposes as well as for evaluating compliance with the federal 24-hour PM10 standard. A "shoreline and near-shore PM10 monitor" is defined by the 2008 SIP as "...a fixed or portable USEPA-approved Federal Reference Method or Equivalent Method PM10 Monitor located approximately on the 3600-foot elevation (historic shoreline) contour, or within the Owens Valley Non-Attainment Area above the 3600-foot elevation." (2008 SIP, Ch. 8, Board Order 080128-01, Attachment B, page 2). Because the proposed location of the air monitor is below the 3,600-foot elevation contour, it violates the terms of the 2008 SIP.

Finally, installing a monitor in DCA T5-1 Addition would violate United States Environmental Protection Agency (USEPA) siting criteria contained in 40 C.F.R. 58 Appendix E. These criteria must be followed by the District "to the maximum extent possible" in order to ensure the accuracy, reliability, and integrity of the data collected from the proposed monitor by avoiding the influence of external factors such as roadways, minor emission sources, and other obstructions

[40 C.F.R., App. E, §§ 1(a), (b)]. The data produced by the District's proposed monitor would undoubtedly be impacted by LADWP's ongoing dust control activities within the ROW, including operation and maintenance of the irrigation system, and therefore an inaccurate reflection of actual PM10 emissions within the area. The District would be unable to use data from the proposed monitor to show compliance with the National Ambient Air Quality Standards or as the basis for issuing future dust control orders to LADWP. Thus, not only would the proposed monitor be incompatible with LADWP's current use of the ROW, but it would also conflict with EPA's mandatory requirement of obtaining accurate, reliable and useful air quality data from the monitor.

In sum, LADWP objects to the installation of an air monitor in the T5-1 Addition ROW, or within any other surrounding Bureau lands that are being used for dust control mitigation.

If you have any questions or would like to consult with LADWP further regarding this significant issue, please contact me at (213) 367-1014, or Mr. William Van Wagoner, Manager of Owens Lake Regulatory Issues and Future Planning, at (213) 367-1138.

Sincerely,

Martin L. Adams
Director of Water Operations

WTV:jmm

Enclosure

c/enc: Mr. Theodore Schade, District
Mr. Michael Flagg, USEPA
Mr. William Van Wagoner, LADWP

United States Department of the Interior

BUREAU OF LAND MANAGEMENT

Bishop Field Office
351 Pacu Lane, Suite 100.
Bishop, CA 93514
Phone: 760 872-5000
Fax: 760 872-5050
www.ca.blm.gov/bishop

CACA 050145
2800-P
CA170.10

OCT 31 2008

Decision

Los Angeles Dept Water & Power	=	Application for ROW CACA 50145
111 North Hope St., Rm 1468	=	Owens Lake Dust Mitigation
Los Angeles, CA 90012	=	Pipeline and Drip Irrigation Area

Right-of-Way Grant Issued
Rental Waived

On July 29, 2008 the Los Angeles Department of Water and Power (LADWP) filed an application for a 20+ year (renewable) right-of-way (ROW) grant for the construction, operation, maintenance, and termination of a pipeline and drip irrigation system with associated facilities under the authority of the Federal Land Policy and Management Act (FLPMA) of October 21, 1976, (90 Stat. 2776, 43 U.S.C. 1761). The 31 +/- acre irrigation area would be used for PM10 dust mitigation as part of the overall Owens Lake Dust Mitigation Project currently being implemented within the Owens Lake basin. The area would contain; water sub-mains, a drip irrigation pipeline system, retaining and collection berms, access roads, filtration system and any other equipment needed for the irrigation system.

Under the Great Basin Unified Air Pollution Control District (GBUAPCD) 1998, 2003, revised 2005 State Implementation Plan and Environmental Impact Report the Los Angeles Dept. of Water and Power (LADWP) utilized various dust control methods on large areas of the Owens Lake shoreline in order to reduce PM10 emissions. Analysis of these control actions indicated that additional dust emitting areas would need treatment.

The Final GBUAPCD 2008 Owens Valley PM10 Planning Area Demonstration of Attainment State Implementation Plan (SIP) and Environmental Impact Report (EIR) Phase 7 was written for the proposed dust mitigation actions on an additional 9,664 acres needing treatment in order to reduce Owens Lake PM10 emissions to the National Ambient Air Quality Standards level by 2010.

The GBUAPCD 2008 SIP EIR for Phase 7 showed that about 31 acres of public land located 0.3 miles southwest of Dirt Socks and known as Dust Control Area (DCA) T5-B (as shown in the EIR, and shown as T5-1 on the project map) would require dust mitigation. Under the Phase 7 additional mitigation project, T5-B is a small part of a larger 9,664 acre area of lakebed which would be mitigated. As part of the larger dust mitigation project, LADWP has proposed to mitigate the dust problem on public land at T5-B. This proposal is acceptable to the BLM and has led LADWP to the filing of the ROW application for the proposed project. LADWP also requested that the annual rental fee be waived for the project based on the construction and long-term operation costs of mitigating the PM10 dust emissions on public land.

The Phase 7 mitigation is expected to continue to reduce health hazards for residents of the nearby towns of Keeler, Olancha, Cartago and Lone Pine, and improve the ability to control and manage PM10 concentrations, and improve air quality in the neighboring environment.

The application for the right-of-way is generally located in:

Mount Diablo Meridian, California,

T. 18 S., R. 37 E.,

Section 34, NW1/4 of the SE1/4;

Containing 31 acres more or less.

The proposed action has been analyzed under environmental document "Documentation of Land Use Plan Conformance and NEPA Adequacy (DNA) DOI-BLM-CA-070-2009-0006 DNA". The DNA was based on the following environmental document: The Great Basin Unified Air Pollution Control District 2008 Owens Valley PM10 Planning Area Demonstration of Attainment State Implementation Plan (SIP) and Final Subsequent Environmental Impact Report (EIR) for Phase 7 and the underlying SIP EIR documents Volume I, II, and III dated January 14, 2008. This document can be found on the GBUAPCD's website.

This project has impacts on environmental resources and mitigation has been used to minimize cited impacts or lower impacts to a non-significant level except for Green House Gas emissions.

The potential significant impact to air quality concerns the levels of Green House Gas (GHG) emissions from the construction phase of the project. The GBUAPCD points out that there is a lack of agency-adopted standards for which to determine whether the potential cumulative impact is or is not significant. The project does incorporate mitigation measures that substantially reduce GHG emissions during construction. The portion of GHG emissions originating from the construction phase of the 31 acres of public land is not considered by the BLM to be significant in relation to the total emissions of the 9,664 acre project and potentially represents 0.3% of the GHG emissions for the whole dust mitigation project. Since the construction for the 31 acre drip irrigation system does not involve a complete grading of the surface area, the GHG emissions for this aspect of the overall dust mitigation project are extremely low, and with mitigation fall below the significant level. Concerning GHG emissions and potentially Global Warming impacts, current regulations and standards in regards to greenhouse gases have not been developed and finalized, and the BLM finds that it cannot be determined to a reasonable degree of certainty that the proposed 31 acre project would result in a considerable incremental contribution to the significant cumulative impact of global climate change.

The above cited 2008 SIP EIR describes, analyzes, and mitigates the proposed action to below non-significant levels and is acceptable to the BLM with mitigation as described the SIP EIR and with standard stipulations within the Grant document. The document constitutes BLM compliance with the requirements of NEPA.

Under the authority of the Federal Land Policy and Management Act of October 21, 1976 (43 U.S.C. 1761) Title V, as amended, I hereby issue to the LADWP a Right-of-Way Grant CACA 050145 to construct, operate, maintain, and terminate a 31 +/- acre pipeline and drip irrigation area with associated facilities. The area would contain water sub-mains, a drip irrigation pipeline system, retaining and collection berms, access roads, filtration system, and any other equipment needed for the irrigation area. The ROW area is located as per the Grant document Exhibits A and B. The ROW is granted for 27 years + 2 months (renewable) with standard ROW stipulations and the stipulation cited below (Grant document Exhibit C). The ROW will expire on December 31, 2035. It is expected that LADWP may apply for renewal of the ROW prior to the 2035 expiration date. The annual rental for the ROW is waived. This decision is in full force and effect upon signature.

The stipulations described below apply to the construction phase of the project.

1. LADWP agrees to incorporate any and all mitigations measures which apply to the construction of the pipeline and irrigation area for the Dust Control Area (DCA) T5-B (T5-1) project, as cited in the Great Basin Unified Air Pollution Control District 2008 Owens Lake PM10 Planning Area Demonstration of Attainment State Implementation Plan (SIP) Final Subsequent Environmental Impact Report (EIR) Volume I, II, and III. Mitigation measures for the action are located in Volume I Executive Summary of the 2008 SIP and EIR.

The use of a "right-of-way" authorization is proper due to the lineal nature of the various facilities and structures placed within the shallow flood area, such as, pipelines, roads, berms, and water collection ditches and pipelines. Under 43 CFR 2801.6(a)(1), the BLM is given authority to issue right-of-ways on public land for "....systems and facilities which are in the public interest and which require the use of public lands for the purposes identified in 43 U.S.C. 1761".

Under 43 CFR 2806.15(b)(1), the BLM may waive or reduce the rental payment when the holder is a non-profit organization, corporation, or association which is not controlled by, or is not a subsidiary of, a profit making corporation or business enterprise and the facility or project will provide a benefit or special service to the general public or to a program of the Secretary. I have waived the annual rental for the ROW due to LADWP's anticipated multi-million dollar cost of mitigating PM10 dust emissions on the public land and the Owens Lake. LADWP is providing a valuable benefit to the general public by undertaking the dust mitigation project thereby reducing PM10 emissions on public land and throughout the Owens Lake basin.

Although there will be unavoidable minimal impacts to various resources such as; loss of up to 31 acres of scrub vegetation, permanent removal of nesting and brooding snowy plover habitat (which has been mitigated), and loss of common wildlife habitat on the 31 acres of public land under the proposed action,; there will be a increased reduction of PM10 emissions from the 31 acres of public land. These PM10 emissions are a human health, air quality, and visual quality problem which override the potential resource impacts resulting from the Owens Lake dust mitigation construction and operation project. The loss of some shadscale scrub vegetation is an unavoidable impact, but the surrounding public land has thousands of acres of similar vegetation. The drip irrigation system will enhance the existing vegetation and will promote new growth of saltgrass and other vegetation species and provide new habitat for the snowy plover and other shore-bird types.

It is in the public interest to authorize the use of public land by the Los Angeles Department of Water and Power so that the 2008 State Implementation Plan and the Phase 7 Project for the Owens Lake Dust Mitigation Program can be implemented. PM10 dust mitigation on public land will dramatically reduce PM10 emissions originating from public land located southwest of Dirty Socks and will contribute to the overall reduction of PM10 emissions from Owens Lake to the levels as required by the National Ambient Air Quality Standards by 2010. There is an overall health benefit from PM10 emission reduction and a general improvement of air and visual quality for Keeler, Olancha, Cartago, Lone Pine and the Owens Valley especially during high wind events. The PM10 Dust Mitigation Project is a comprehensive effort to reduce dust emissions from lands in the Owens Lake basin. The public land identified as Dust Control Area T5-B (T5-1) is contributing to the emission problem and should be part of this effort.

This decision may be appealed to the Interior Board of Land Appeals, Office of the Secretary, in accordance with the regulations contained in 43 CFR, Part 4 and the enclosed Form 1842-1. If an appeal is taken your notice of appeal must be filed in this office (at the above address) within 30 days from receipt of this decision. The appellant has the burden of showing that the decision appealed from is in error. If you wish to file a petition pursuant to regulation 43 CFR 4.21 (58 FR 4939, January 19, 1993) or 43 CFR 2804.1 for a stay of the effectiveness of this decision during the time that your appeal is being reviewed by the Board, the petition for a stay is required to show sufficient justification based on the standards listed below. Copies of the notice of appeal and petition for a stay must also be submitted to each party named in this decision and to the Interior Board of Land Appeals and to the appropriate Office of the Solicitor (see 43 CFR 4.413) at the same time the original documents are filed with this office. If you request a stay, you have the burden of proof to demonstrate that a stay should be granted:

<u>Standards for Obtaining a Stay</u>

Except as otherwise provided by law or other pertinent regulation, a petition for a stay of a decision pending appeal shall show sufficient justification based on the following standards:

(1) The relative harm to the parties if the stay is granted or denied,

(2) The likelihood of the appellant's success on the merits,

(3) The likelihood of immediate and irreparable harm if the stay is not granted, and

(4) Whether the public interest favors granting the stay.

Joe Pollini

Joe Pollini
Acting Field Manager
Bishop Field Office

Enc: Appeal Form 1842-1
Grant CACA 050145

ROW Monitoring Fee Category Determination Decision for FLPMA and MLA Rights-of-Way

Application Serial No. CACA 050145
Applicant: LOS ANGELES DEPT OF WATER AND POWER
Address: 111 N. HOPE ST., RM 1468
LOS ANGELES, CA 90012
Agent: MILAD TAGHAVI, PAUL PAU
Address: SAME AS ABOVE

Location: TS-1 AREA WEST OF DIRTY SOCKS

Personnel Needed for Monitoring	Estimated Monitoring Hours
Realty Specialist/Land Law Examiner	40
Cultural/Paleontological Resources	
T&E Species	
Wildlife/Fisheries	
Air/Water/Soils	
Recreation/Visual	
Range	
Administration/Contracting	
Fluids/Minerals	
Manager	
Other	
Other	
TOTAL HOURS	40

The appropriate Monitoring Category for this action is Category IV. The Monitoring fee for this Category is $1,040. Monitoring fees for Categories 1-4 are non-refundable. See attached table for category definitions and fee schedule.

Prepared By: [signature] 10-28-08
Realty Specialist Date

Approved By: [signature] 10-28-08
Authorized Officer Date

Attachment 2-1

ROW Processing Fee Category Determination Decision For FLPMA and MLA Rights-of-Way

Application Serial Number: CACA 050145
Applicant: LOS ANGELES DEPT OF WATER AND POWER
Address: 111 N. HOPE ST, RM 1468
LOS ANGELES CA 90012
Agent: MILAD TAGHAVI, PAUL PAU
Address SAME AS ABOVE

Application For: PIPELINE AND DRIP IRRIGATION SYSTEM AREA
Location: T5-1 AREA WEST OF DIRTY SOCKS

Pre-Application Meeting Held: ___ No X Yes VARIOUS (date)

Land Use Plan Conformance? ___ No X Yes

Estimated Processing Requirements:
Type of ROW: X FLPMA ___ MLA

NEPA Action Required: ___ EIS ___ EA X DNA ___ CE/CX

Personnel Needed for Processing	Estimated Processing Hours
Realty Specialist/Land Law Examiner	24
Cultural/Paleontological Resources	16
T&E Species	
Wildlife/Fisheries	
Air/Water/Soils	
Recreation/Visual	
Range	
Fluids/Minerals	
Administration/Contracting	
Manager	2
Other ENV COORDINATOR	2
Other	
TOTAL HOURS	44

The appropriate Processing Category for this application is Category IV. The Processing fee for this Category is $1040. Processing fees for Categories 1-4 are non-refundable. See enclosed table for Category definitions and fee schedule.

Prepared By: [signature] Realty Specialist — Date: 10-28-08

Approved By: Joe Pollini Authorized Officer — Date: 10/28/08

Form 2800-14
(August 1985)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

RIGHT-OF-WAY GRANT/~~TEMPORARY USE PERMIT~~

Issuing Office
Bishop Field Office

Serial Number
CACA 050145

1. A (right-of-way) ~~(permit)~~ is hereby granted pursuant to:

   a. [X] Title V of the Federal Land Policy and Management Act of October 21, 1976 (90 Stat. 2776; 43 U.S.C. 1761);

   b. [ ] Section 28 of the Mineral Leasing Act of 1920, as amended (30 U.S.C. 185);

   c. [ ] Other (describe) ____________.

2. Nature of Interest:

   a. By this instrument, the holder Los Angeles Department of Water and Power receives a right to construct, operate, maintain, and terminate a Pipeline and Drip Irrigation System on public lands (or Federal land for MLA Rights-of-Way) described as follows:

Mount Diablo Meridian,
California,
T. 18 S., R. 37 E.,
Section 34,
NW1/4 of the SE1/4,
amounting to 31 acres +/-;
more accurately depicted on
Exhibit A dated 10-15-08.

   b. The right-of-way or permit area granted herein is ______ feet wide, ______ feet long and contains ______ acres, more or less. If a site type facility, the facility contains 31 +/- acres.

   c. This instrument shall terminate on December 31, 2035 27 + 2 mns years from its effective date unless, prior thereto, it is relinquished, abandoned, terminated, or modified pursuant to the terms and conditions of this instrument or of any applicable Federal law or regulation.

   d. This instrument [X] may [ ] may not be renewed. If renewed, the right-of-way or permit shall be subject to the regulations existing at the time of renewal and any other terms and conditions that the authorized officer deems necessary to protect the public interest.

   e. Notwithstanding the expiration of this instrument or any renewal thereof, early relinquishment, abandonment, or termination, the provisions of this instrument, to the extent applicable, shall continue in effect and shall be binding on the holder, its successors, or assigns, until they have fully satisfied the obligations and/or liabilities accruing herein before or on account of the expiration, or prior termination, of the grant.

3. Rental:

For and in consideration of the rights granted, the holder agrees to pay the Bureau of Land Management fair market value rental as determined by the authorized officer unless specifically exempted from such payment by regulation. Provided, however, that the rental may be adjusted by the authorized officer, whenever necessary, to reflect changes in the fair market rental value as determined by the application of sound business management principles, and so far as practicable and feasible, in accordance with comparable commercial practices.

4. Terms and Conditions:

a. This grant or permit is issued subject to the holder's compliance with all applicable regulations contained in Title 43 Code of Federal Regulations parts 2800 and 2880.

b. Upon grant termination by the authorized officer, all improvements shall be removed from the public lands within 90 days, or otherwise disposed of as provided in paragraph (4)(d) or as directed by the authorized officer.

c. Each grant issued pursuant to the authority of paragraph (1)(a) for a term of 20 years or more shall, at a minimum, be reviewed by the authorized officer at the end of the 20th year and at regular intervals thereafter not to exceed 10 years. Provided, however, that a right-of-way or permit granted herein may be reviewed at any time deemed necessary by the authorized officer.

d. The stipulations, plans, maps, or designs set forth in Exhibit(s) A and B and C, dated October 15, 2008, attached hereto, are incorporated into and made a part of this grant instrument as fully and effectively as if they were set forth herein in their entirety.

e. Failure of the holder to comply with applicable law or any provision of this right-of-way grant or permit shall constitute grounds for suspension or termination thereof.

f. The holder shall perform all operations in a good and workmanlike manner so as to ensure protection of the environment and the health and safety of the public.

APPROVED AS TO FORM AND LEGALITY
ROCKARD J. DELGADILLO, CITY ATTORNEY

OCT 21 2008

BY [signature]
S. DAVID HOTCHKISS
Assistant City Attorney

IN WITNESS WHEREOF, The undersigned agrees to the terms and conditions of this right-of-way grant or permit

[signature] (Signature of Holder)
H. David Nahai

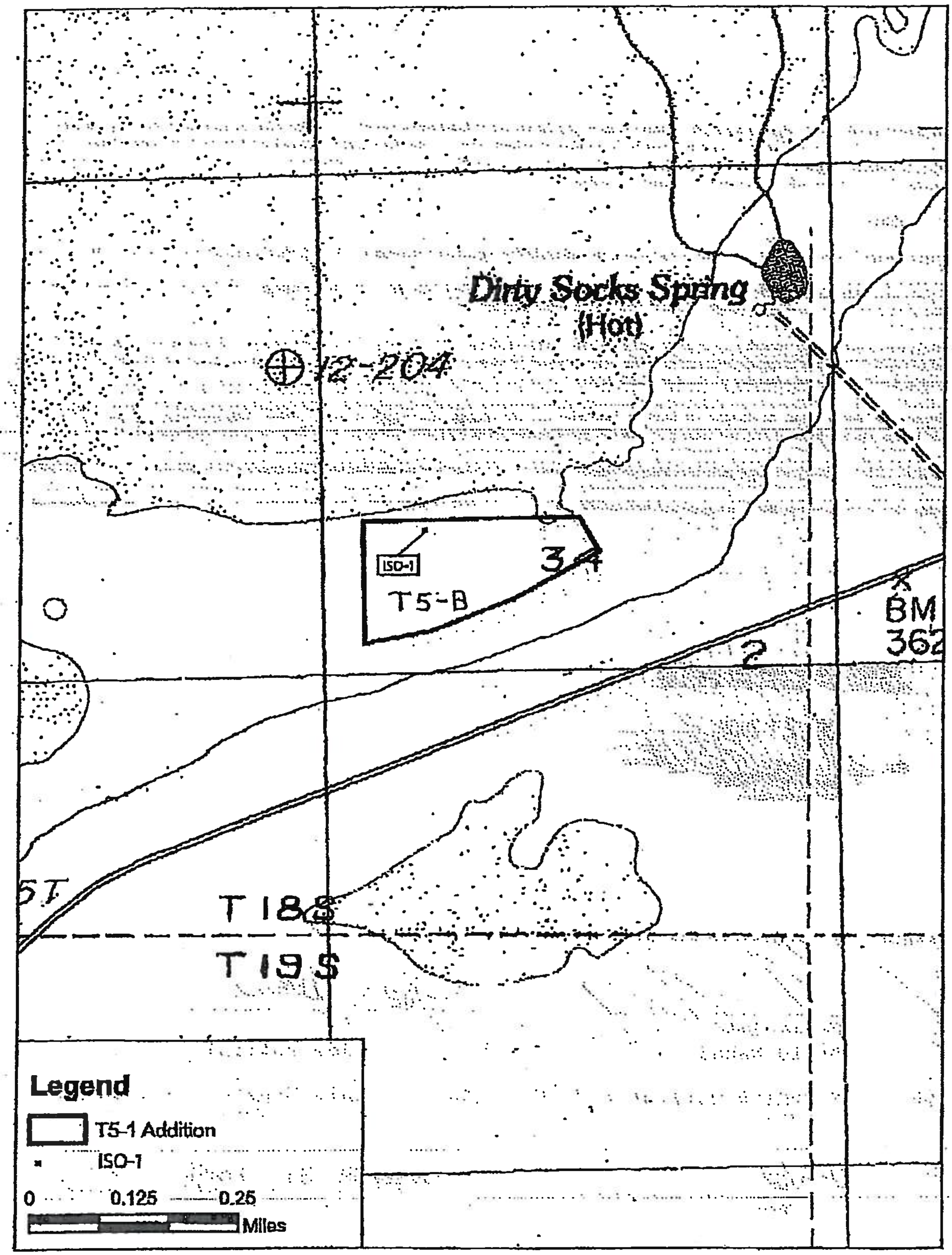
LADWP Chief Executive Officer and GM
(Title)

10/27/08
(Date)

Joe Pollini (Signature of Authorized Officer)
Joe Pollini

Acting Field Manager, Bishop FO
(Title)

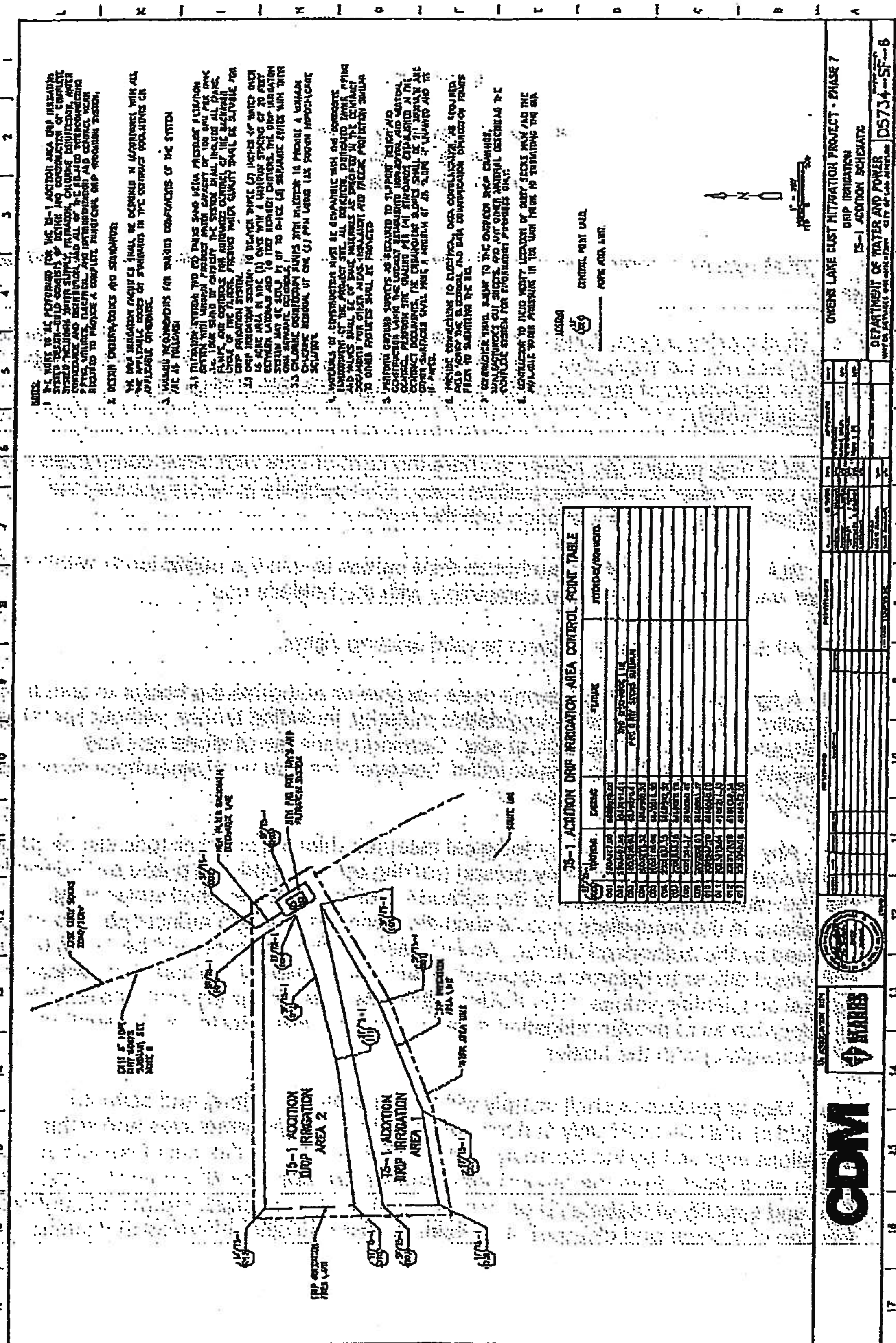
OCTOBER 31, 2008
(Effective Date of Grant)



USGS Vermillion Canyon 7.5' Quadrangle 1994

Figure 2. Survey Area and ISO-1
Phase 7 Owens Lake Dust Mitigation Program

EXHIBIT A 10-15-08 [initials]



D5734-SF-8

EXHIBIT B 10-15-08

EXHIBIT C

Right-of Way Stipulations
CACA 050145
October 15, 2008

1. BLM retains a continuing right of access to enter the public land covered by the grant.

2. BLM retains a continuing right to enter physically any part of a facility constructed on a right-of-way for inspection, monitoring, or any other purpose consistent with the needs or obligations of the United States. This right is subject to giving the holder reasonable notice.

3. BLM may require the holder to share the right-of-way with other compatible right-of-way use or other compatible multiple uses. Compatibility is determined by the authorized officer after consultation with the holder.

4. BLM retains the right to authorize third parties to use the public lands within the right-of-way. Such use shall be compatible with the holder's use.

5. All rights granted are subject to valid existing rights.

6. A right-of-way grant or permit does not give or authorize the holder to take from the public lands any mineral or vegetative material, including timber, without securing authorization under 30 USC 601 et seq. Common varieties of stone and soil necessarily removed during construction, however, may be used elsewhere along the same right-of-way or permit area.

7. Any cultural and/or paleontological resource (historic or prehistoric site or object) discovered by the holder, or any person working on his behalf, on public or Federal land shall be immediately reported to the authorized officer. Holder shall suspend all operations in the immediate area of such discovery until written authorization to proceed is issued by the authorized officer. An evaluation of the discovery will be made by the authorized officer to determine appropriate actions to prevent the loss of significant cultural or scientific values. The holder will be responsible for the cost of evaluation and any decision as to proper mitigation measures will be made by the authorized officer after consulting with the holder.

8. Use of pesticides shall comply with the applicable Federal and state laws. Pesticides shall be used only in accordance with their registered uses and within limitations imposed by the Secretary of the Interior. Prior to the use of pesticides, the holder shall obtain from the authorized officer written approval of a plan showing the type and quantity of material to be used, pest(s) to be controlled, method of application, location of storage and disposal of containers, and any other information deemed

necessary by the authorized officer. Emergency use of pesticides shall be approved in writing by the authorized officer prior to such use.

9. The holder(s) shall comply with all applicable Federal, State, and local laws and regulations, existing or hereafter enacted or promulgated, with regard to any Hazardous Material, as defined in this paragraph, that will be used, produced, transported or stored on or within the R/W or any of the R/W facilities, or used in the construction, operation, maintenance or termination of the R/W or any of its facilities. "Hazardous material" means any substance, pollutant or contaminant that is listed as hazardous under the CERCLA of 1980, as amended, 42 U.S.C. 9601 et seq., and its regulations. The definition of hazardous substances under CERCLA includes any "hazardous waste" as defined in the RCRA of 1976, as amended, 42 U.S.C. 6901 et seq. and its regulations. The term hazardous materials also includes any nuclear or byproduct material as defined by the Atomic Energy Act of 1954, as amended, 42 U.S.C. 2011 et seq. The term does not include petroleum, including crude oil or any fraction thereof that is not otherwise specifically listed or designated as a hazardous substance under CERCLA section 101(14), 42 U.S.C. 9601(14), nor does the term include natural gas.

10. All equipment must be washed prior to entering public land to remove weed seeds or accumulated dirt which may carry weed seeds.

11. LADWP agrees to incorporate any and all mitigations measures which apply to the construction of the pipeline and drip irrigation area for the Dust Control Area (DCA) T5-B (T5-1) project, as cited in the Great Basin Unified Air Pollution Control District 2008 Owens Lake PM10 Planning Area Demonstration of Attainment State Implementation Plan (SIP) Final Subsequent Environmental Impact Report (EIR) Volume I, II, and III. Mitigation measures for the action are located in Volume I Executive Summary of the 2008 State Implementation Plan EIR.

From: Primosch, Lawrence [mailto:lprimosc@blm.gov]
Sent: Sunday, May 05, 2013 1:39 PM
To: VanWagoner, William; nabarbieri@gbuapcd.org
Subject: Air Monitoring Station Amendment Application CACA 042345 within LADWP ROW Area CACA 050145

HI Guys! Bill, I have LADWP ltr 3-26-2013 regarding the proposed monitoring station within the dust mitigation ROW area held by LADWP and your concern against installing the station in that area.

We would have asked you all about any potential conflict this might cause, but this letter gives us the idea of your concern.

Although your use of the parcel leaves a large part not being used, I can see that you may increase your activities there and the station may get in the way of this acttion, and construction and travel to the site may increase dust generation in the area where you all are trying to control these things.

I will ask that GBUAPCD consider a site near the boundary of the ROW use area so that they will not impact your activities.

This is should not be interrupted that we will deny their app and may still analyze the site for their use; you would then be able to appeal the decision if that is what we do for the station.

I appreciate your concern and it will be taken into consideration

Department of Water and Power the City of Los Angeles

ANTONIO R. VILLARAIGOSA
Mayor

Commission
THOMAS S. SAYLES, President
ERIC HOLOMAN, Vice President
RICHARD F. MOSS
CHRISTINA E. NOONAN
JONATHAN PARFREY
BARBARA E. MOSCHOS, Secretary

RONALD O. NICHOLS
General Manager

May 17, 2013

Mr. Larry Primosch
Lands and Realty Specialist
Bureau of Land Management Bishop Field Office
351 Pacu Lane, Suite 100
Bishop, CA 93514

Dear Mr. Primosch:

Subject: Los Angeles Department of Water and Power's Objections to the Great Basin Unified Air Pollution Agency's Request to Amend ROW Authorization No. CACA 042345

The Los Angeles Department of Water and Power (LADWP) understands the Great Basin Unified Air Pollution Control District (District) requested an amendment to Right of Way Authorization (ROW) No. CACA 042345 on January 24, 2013, to install two new monitors. LADWP learned about the District's request only after receiving the Bureau of Land Management's (BLM) response to LADWP's Freedom of Information Act request in early March 2013. LADWP objects to the District's proposed ROW authorization amendment on the following grounds.

1. **The Existing ROW Authorization cannot be "Amended" Because the Physical Locations have changed.**

ROW No. CACA 042345 authorized the construction, operation, and maintenance of two PM_{10} air quality monitoring sites at Shell Cut and Flat Rock. However, the District's request for a ROW amendment was for two entirely different PM_{10} air quality monitoring stations, located miles away from the two original locations: one at Dirty Socks, and another at Mill Site. Because the locations have changed, the ROW authorization cannot be simply "amended." A new ROW authorization is required.

2. **The ROW Amendment Application did not Include an Environmental Impact Assessment.**

The original ROW Authorization No. CACA 042345 was supported by a biological and cultural resource assessment for the Shell Cut and Flat Rock monitoring locations,[1] which are miles away from the new proposed locations at Dirty Socks and Mill Site. Neither the District nor BLM appears to have conducted any biological or cultural surveys at the new locations, nor did either agency assess the impacts associated with site construction, operation, and maintenance on local populations of fish and other aquatic life, plant life, and wildlife, including threatened or endangered species. Both locations are within the domain of at least some listed species, including the Mojave ground squirrel and the desert tortoise. As recently as 1995, a District employee reported finding an adult tortoise along the shores of Owens Lake. The Mojave ground squirrel, a threatened species listed under the California Endangered Species Act (ESA), was sighted and identified 1.5 miles north of Olancha in 1980, and at the lower Centennial Flat in 1989.[2] Surveys should be performed to determine if these or any other threatened or endangered species are found within or near the proposed construction sites. A comprehensive biological and cultural resource assessment, in addition to ESA and National Environmental Policy Act (NEPA) compliance, should be performed for the new sites and submitted to the BLM for approval prior to any construction at the two new sites.

3. **The Proposed Monitoring Sites at Dirty Socks and Mill Site Violate the 2008 SIP and EPA Siting Criteria for Compliance Air Quality Monitors.**

The District's proposed new monitoring stations at Dirty Socks and Mill Site violate the conditions set forth in the District's 2008 Owens Valley Planning Area (OVPA) PM10 State Implementation Plan (2008 SIP), as well as the EPA's siting guidelines for PM_{10} air quality monitors contained in 40 C.F.R. 58 Appendix E.

The proposed Dirty Socks monitoring location lies below the regulatory shoreline defined in the 2008 SIP as the 3,600-foot elevation. The 2008 SIP calls for the use of "shoreline and near-shore" PM_{10} monitors to assess air quality conditions within the Owens Valley, and to identify new supplemental control areas on the Owens playa.

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[1] Sapphos Environmental. 2000. "Biological and Cultural Resource Assessment for Two New Air Monitoring Sites at Owens Valley, Inyo County, California." Prepared by Sapphos Environmental Inc., 133 Martin Alley, Pasadena, California. June 30, 2000.

[2] California Department of Fish and Game. 1999. Natural Diversity Data Base. The Resources Agency, State of California, Sacramento. Extracted from footnote 1 reference above.

According to the 2008 SIP, "*A shoreline or near-shore PM_{10} monitor is a fixed or portable USEPA-approved Federal Reference Method or Equivalent Method PM_{10} Monitor located approximately on the 3600-foot elevation (historic shoreline) contour, or within the Owens Valley Non-Attainment Area above the 3600-foot elevation.*" [Board Order 080128-01, Chapter 8, Attachment B, 2008 OVPA Supplemental Control Requirements Determination Procedure, Page 2 of 17.] The proposed Dirty Socks monitor is not "approximately on" the 3,600-foot elevation contour, it is an important distance below that elevation with a dry playa area lying immediately adjacent to the proposed site on the lakeward side. This proposed Dirty Socks site should be disallowed because it does not meet the definition of a "shoreline and near-shore" monitor.

The proposed Mill Site lies adjacent to a significantly deteriorated section of the Old State Highway, and as such violates the EPA's siting criteria contained in 40 C.F.R. 58 Appendix E. Under 40 C.F.R. Part 58, Appendix E, 3. Spacing From Minor Sources: "*The plume from the local minor sources should not be allowed to inappropriately impact the air quality data collected at a site. Particulate matter sites should not be located in an unpaved area unless there is vegetative ground cover year round, so that the impact of wind blown dusts will be kept to a minimum.*" The highway that lies adjacent to the proposed Mill Site was last used and maintained in the 1950's, and is now missing most of the asphalt and constitutes an unpaved road rather than a paved road. Fine silts and sands now cover most of the "highway," deposited from flash flood waters that are frequent on this section of the Owens shoreline. Dust plumes generated along the roadway, which occur even in the absence of vehicle traffic, are likely to significantly influence the PM_{10} concentrations measured at the site, and as such violate the siting criteria in 40 C.F.R. Part 58, Appendix E. BLM should disallow the proposed Mill Site authorization on this basis alone.

4. The Proposed ROW "Amendment" is Part of the District's Air Quality Monitoring Network for Owens Lake, Which is Operating in Clear Violation of the EPA's Quality Assurance Criteria.

As LADWP pointed out in a letter to Dr. Lakin, EPA, dated September 8, 2012, the District has been operating its PM_{10} and $PM_{2.5}$ network in the Owens Valley without EPA-approved Quality Assurance Project Plans (QAPP) since the year 2000. Title 40 Code of Federal Regulations (CFR) Part 58 Appendix A requires, among other things, that "*All monitoring organizations must develop a quality system that is described and approved in quality management plans (QMP) and quality assurance project plans (QAPP)...*" (40 C.F.R. 58 Appendix A, § 2.1). On September 8, 2011, LADWP requested copies of the District's PM_{10} and $PM_{2.5}$ QAPPs. The PM_{10} and $PM_{2.5}$ QAPPs were received from the District on September 22, 2011, and September 27, 2011, respectively. Both QAPPs were unsigned, designated as "drafts" (dated March 2001 and November 2002, respectively), and never approved by EPA.

In later correspondence related to LADWP's appeal of the District's 2011 Supplemental Control Requirement Determination ("2011 SCRD") to the California Air Resources Board ("ARB"),[3] attorneys for the District argued that it and other districts have approved QAPPs under the ARB, and that ARB has obtained EPA's approval for the QAPPs. However, the ARB Quality Assurance Plan ("QAP")[4] does not fulfill the quality assurance project plan requirements in 40 C.F.R. 58 because it does not address all the unique instrument systems and processes that generate the data used to identify supplemental control areas on Owens Lake, nor does it address the District's monitoring organization, among other omissions. Some of the missing system elements (*e.g.*, sand motion monitoring, video monitoring) are described on page 11 of the District's 2012 Network Monitoring Plan section entitled "Dust Identification Program." To be clear, although the ARB QAP encompasses the State and Local Air Monitoring System (SLAMS) network that is the subject of the District's 2012 Network Monitoring Plan, it does not cover the *use* of this data to identify supplemental dust control areas on Owens Lake because it does not properly assure quality for all the instrument systems that are used in the dust source identification process described in the 2008 SIP.

LADWP requested that the District update its PM_{10} and $PM_{2.5}$ QAPPs, encompassing all of the instrument systems that are required to implement the procedures described in the 2008 SIP, including the monitoring organization structure and functions; and to have them approved in a public proceeding in order to ensure that the data are being collected and analyzed in accordance with recognized quality assurance procedures. LADWP also requested that the District complete this work expeditiously, as the monitoring network is active and currently being used to identify emissive sources on Owens Lake and the Keeler Dunes, to evaluate compliance within the Owens Valley Planning Area, and to assess the contributions from Owens Lake as far as 18 miles away at the Coso Junction Maintenance Area.

In response to LADWP's comments above regarding the lack of approved QAPPs, the District asserted in its May 23, 2012, staff report that: "*...it is not the LADWP's place to*

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3 District Opposition Brief Regarding the 2011 SCRD Appeal, State of California Air Resources Board, dated April 19, 2012.

4 The ARB QAP was designed primarily as a guidance document for the operation of quality assurance programs used by the ARB, local air districts, and industry, whereas a QAPP is a more detailed plan that describes the quality assurance procedures for a particular project.

determine the validity of the ARB or District's QAPP," and that "*...these documents are scheduled for revision during the 2012 calendar year.*" First, LADWP's comments were submitted as part of the public review period. Second, LADWP is entitled to question the content and validity of the District's QAPPs. The District's monitoring network has been operating on the Owens playa for over 10 years, and the data collected from the network have led to the identification, design, and implementation of over 40 square miles of dust controls on the playa, at a cost of well over $1 billion dollars. LADWP and its four million ratepayers have every right to expect that the agency responsible for ordering dust controls in the OVPA – the District – is in compliance with all federal rules governing the collection and quality assurance of data used in the decision making process. The District has been negligent in these duties for more than 10 years. Moreover, even if the PM_{10} QAPP is eventually approved as the District contends, it is far too little too late for LADWP and its ratepayers. EPA and ARB share proportional responsibility for allowing the District's breach of these obligations to continue for so long and at such great expense to LADWP.

Because the District is operating its $PM_{2.5}$ and PM_{10} monitoring network clearly in violation of 40 CFR Part 58 Appendix A, and because the proposed ROW authorization is part of that $PM_{2.5}$ and PM_{10} monitoring network, the BLM must disallow the proposed authorization on this basis alone.

As a manager in Owens Valley, BLM should share LADWP's concerns. LADWP would welcome the opportunity to discuss these issues with BLM. If you have any questions or require additional information, please do not hesitate to contact me at (213) 367-1014, or Mr. William T. Van Wagoner, Manager of Owens Lake Regulatory Issues and Future Planning, at (213) 367-1138.

Sincerely,

Martin L. Adams
Director of Water Operations

WTVW:rdn
c: Mr. William T. Van Wagoner

Department of Water and Power the City of Los Angeles

ANTONIO R. VILLARAIGOSA
Mayor

Commission
THOMAS S. SAYLES, *President*
ERIC HOLOMAN, *Vice President*
RICHARD F. MOSS
CHRISTINA E. NOONAN
JONATHAN PARFREY
BARBARA E. MOSCHOS, *Secretary*

RONALD O. NICHOLS
General Manager

June 19, 2013

Mr. Larry Primosch
Lands and Realty Specialist
Bureau of Land Management Bishop Field Office
351 Pacu Lane, Suite 100
Bishop, CA 93514

Subject: Great Basin Unified Air Pollution Control District Requests to Relocate Monitor in ROW Authorization No. CACA 50145 (Dust Control Area T5-1 Addition) and/or Modify ROW Authorization No. CACA 042345 to Relocate Two Monitors

Dear Mr. Primosch:

This letter responds to your May 5, 2013, email to William VanWagoner (enclosed) regarding the City of Los Angeles Department of Water and Power's (LADWP) March 26, 2013, letter to the Bureau of Land Management (Bureau) objecting to Great Basin Unified Air Pollution Control District's (District) request to relocate one of its existing air monitors into Right of Way (ROW) Authorization No. CACA 50145 held by LADWP and used to operate a pipeline and drip irrigation system for the Owens Lake Dust Mitigation Project. After LADWP submitted its March 26 objection letter, LADWP learned that the District has also requested a modification of its ROW Authorization No. CACA 042345 to add two new monitors formerly located at Dirty Socks and Mill Site. LADWP sent the Bureau a letter on May 17, 2013, objecting to the District's request, to which you responded by email on June 1, 2013 (also enclosed). We understand that the Bureau has not acted on either of the District's requests.

As a preliminary matter, LADWP requests that the Bureau clarify which of the District's requests the Bureau is currently processing with respect to the new monitors. Are both monitors proposed to be in District ROW 042345, or is one proposed to be located in LADWP's ROW 50145? Or, is the District actually proposing three new monitors, two in District ROW 042345, and one in LADWP's ROW 50145? LADWP objects to installation of new monitors irrespective of location.

1. **District Request to Relocate Dirty Socks Monitor In LADWP ROW 50145.**

The District is proposing to relocate one of the monitors in LADWP's ROW 50145, which covers approximately 31 acres of Bureau land within LADWP's Dust Control Area T5-1 Addition (DCA T5-1 Addition). The District recently submitted a letter to Steve Nelson at the Bureau on May 29, 2013, purportedly responding to LADWP's objections to locating a new monitor in LADWP's ROW. LADWP, for the reasons set forth in its March 23 objection letter, disagrees with the District's assertion that the proposed location complies with applicable federal regulations and siting criteria. Importantly, the District did not address the specific objections LADWP raised. The proposed location is below, not at or above the 3,600-foot regulatory shoreline, as defined by the 2008 SIP. It is irrelevant that the former location was below the shoreline. As it happened, the former Dirty Socks location was being adversely affected by close-in sources, to the point that the area immediately around the monitor eventually had to be controlled in order to lower the overall concentrations and in that way unmask the smaller contributions from farther away. Until that happened, the concentrations received at the Dirty Socks monitor were being erroneously attributed to a much larger area on the lakebed. The purpose of the monitors is to represent the greater lakebed, not to focus on and magnify the contributions from an immediately adjacent source such as T5-1. The District admits that the construction activities related to installation of the monitor will actually generate dust. Maintenance operations could also produce emissions that the monitors would record. As discussed in LADWP's March 26 letter, these are some of the reasons this monitor location violates United States Environmental Protection Agency's (EPA) siting criteria in Title 40 of the Code of Federal Regulations, Part 58, Appendix E. In short, nearby sources strongly bias the Dust ID modeling and should be avoided. The District should be evaluating airshed compliance, not the impacts from specific nearby sources, and not to feed the data requirements of a documented flawed model.

The Bureau's approach of asking the District to locate the monitor adjacent to the outer boundary of LADWP's ROW use area will <u>not</u> solve the siting problems and would still violate the 2008 SIP. Placing the monitor along the ROW boundary would not eliminate the influences associated with the initial construction or continued access, operation and maintenance of the District's monitoring facility, as discussed above. The monitor's results will be improperly influenced by these activities regardless of where the District's monitor is placed within the DCA T5-1 Addition.

The Bureau's approach of asking the District to locate the monitor on the ROW boundary would also not comply with the stipulations set forth in Exhibit C to LADWP's ROW agreement. The ROW agreement between LADWP and the Bureau makes clear that LADWP may only be required to share the ROW use area with a proposed third party use that is "compatible" with LADWP's dust mitigation activities and, even then, only after prior consultation with LADWP. (ROW, Exh. C, Stipulation Nos. 2 and 3.) As discussed above and in LADWP's March 26 letter, allowing the District to relocate its monitor *anywhere* within the DCA T5-1 Addition or surrounding areas would not be consistent or compatible with LADWP's irrigation system and ongoing dust mitigation activities. Thus, the Bureau must deny the District's request to install the proposed air monitor in accordance with Exhibit C to the ROW.

2. **District Request to Amend ROW 042345 to Add Two New Monitors.**

LADWP stated its objections to the District's proposed ROW authorization amendment in its May 17 letter. We appreciate the Bureau's commitment to prepare an environmental assessment for the new monitors. LADWP remains concerned, however, that the proposed monitors violate conditions in the 2008 SIP and federal regulations and siting criteria. The proposed Dirty Socks monitoring location lies below the regulatory shoreline defined in the 2008 SIP as the 3,600-foot elevation. This proposed Dirty Socks site should be disallowed because it does not meet the definition of a "shoreline and near-shore" monitor. The proposed Mill Site lies adjacent to a significantly deteriorated section of the Old State Highway, and as such violates the EPA's siting criteria contained in 40 C.F.R. 58 Appendix E.

3. **The Bureau, as a Landowner, Could Be Directly Affected by the Proposed Monitors and Their Locations.**

LADWP disagrees with the Bureau's position that the Bureau does not have an interest in the proposed monitors and their locations. Under the Clean Air Act, an owner or "operator" of a "source" that emits air pollutants may be held liable for monitoring and controlling emissions attributable to the source. (42 U.S.C., § 7410(a)(2)(F)(i).) As a landowner on the Owens lakebed and surrounding area, the Bureau is the owner of this emission source and is therefore potentially liable for emissions arising from its property. The District uses information gathered from its network of monitors to project PM10 levels on the lakebed and, ultimately, assign responsibility for controlling these emissions through the issuance of dust control orders. The Bureau has a significant interest in ensuring that the District's monitors are sited appropriately in accordance with EPA requirements so that the data collected by these monitors is, accordingly, accurate, reliable and in full compliance with the law.

4. **The Bureau Is Required to Ensure the Proposed Monitors and Their Locations Comply with Federal Law.**

The Bureau's authority to grant rights-of-way is subject to numerous federal environmental and natural resource protection laws. The Bureau's authority to manage the public lands derives from the Federal Land Management Practices Act (43 U.S.C., §§ 1701, et seq.) (FLPMA). The FLPMA authorizes the Bureau to grant rights-of-way over or upon the public lands for a variety of uses affecting the public interest. (43 U.S.C., § 1761, subd. (a)(7)), and broadly defines a right-of-way to include not only interests in the land of another typically thought of as rights-of-way, such as easements or the right to traverse the public lands, but also a "lease, permit, or license to occupy [or] use" public lands for purposes covered by FLPMA's right-of-way provisions (43 U.S.C., § 1702, subd. (f)). FLPMA provides, in issuing approvals for rights-of-way over federal lands, the Bureau must take into account federal and state land use policies, environmental quality, economic efficiency, and national security, among other factors. (43 U.S.C., § 1763.) Each right-of-way approved by the Bureau must be subject to regulations or stipulations consistent with the FLPMA and other applicable state and federal laws. (43 U.S.C., § 1764, subd. (c).)

The Bureau's authority to grant rights-of-way is also subject to numerous federal environmental and natural resource protection laws. Indeed, the FLPMA itself requires that the Bureau include stipulations in right-of-way grants to ensure compliance with these laws. (43 U.S.C., § 1765, subd. (a); *Montana Wilderness Ass'n v. Fry* (D. Mont. 2004) 310 F. Supp. 2d 1127 [enjoining Bureau right-of-way issued for oil and gas lease based on violations of NEPA and ESA and potential violations of NHPA].) For example, the National Environmental Protection Act (42 U.S.C., §§ 4331, et seq.) requires that the Bureau consider and disclose the potential environmental impacts of right-of-way issuance and operation. (See 42 U.S.C, § 4332, subd. (2)(C).) The Endangered Species Act (16 U.S.C., §§ 1531, et seq.) requires that the Bureau, in issuing a right-of-way, avoid jeopardizing listed endangered or threatened species or adversely affecting their critical habitats. (16 U.S.C. § 1536, subd. (a)(2).) The Clean Water Act (33 U.S.C., §§ 1251, et seq.) imposes limits on discharges of pollutants and dredge and fill material by right-of-way facilities that qualify as point sources or that traverse wetlands or other covered waters. (33 U.S.C., §§ 1311, subd. (a), 1342, subds. (a)(1)-(2), 1344, subds. (a), (c).)

The Bureau, therefore, has a legal obligation to ensure that the proposed air monitors sought to be installed in the requested right-of-way comply with all applicable laws, regulations, and policies. Contrary to your recent e-mail correspondence on June 1, 2013, the issue of whether the proposed monitors comply with EPA regulations is not simply "the District's problem." The Bureau cannot approve any modification to either the District's ROW or LADWP's ROW because, as discussed above, the proposed locations of the new monitors violate and are inconsistent with EPA's mandatory monitor siting criteria and the 2008 SIP. (See also LADWP letters dated March 26, 2013, and May 17, 2013.)

5. <u>Request for Notification of Bureau Actions on the District's Requests</u>.

LADWP requests that it be notified of any activity related to the Bureau's consideration of the District's request to modify its ROW 042345 to add two monitors and/or the District's proposal to install a monitor in LADWP's ROW 050145. For reasons identified in this letter and the objections raised in LADWP's March 26 and May 17 letters, LADWP reiterates its request that the Bureau deny the District's application to amend the ROW and/or to allow the District to install a monitor in LADWP's ROW. If the Bureau nevertheless approves the District's application and ROW modification and/or grants the District permission to install a monitor in LADWP's ROW, please notify LADWP of the date of the Bureau's final agency action(s), as well as the appeal period and procedures.

If you have any questions or require additional information, please do not hesitate to contact me at (213) 367-1014, or William VanWagoner, Manager of Owens Lake Regulatory Issues and Future Planning, at (213) 367-1138.

Sincerely,

Martin Adams
Director of Water Operations

WTVW:rdn
Enclosures
c: Mr. William T. Van Wagoner

From: Primosch, Lawrence [mailto:lprimosc@blm.gov]
Sent: Sunday, May 05, 2013 1:39 PM
To: VanWagoner, William; nabarbieri@gbuapcd.org
Subject: Air Monitoring Station Amendment Application CACA 042345 within LADWP ROW Area CACA 050145

HI Guys! Bill, I have LADWP ltr 3-26-2013 regarding the proposed monitoring station within the dust mitigation ROW area held by LADWP and your concern against installing the station in that area.

We would have asked you all about any potential conflict this might cause, but this letter gives us the idea of your concern.

Although your use of the parcel leaves a large part not being used, I can see that you may increase your activities there and the station may get in the way of this acttion, and construction and travel to the site may increase dust generation in the area where you all are trying to control these things.

I will ask that GBUAPCD consider a site near the boundary of the ROW use area so that they will not impact your activities.

This is should not be interrupted that we will deny their app and may still analyze the site for their use; you would then be able to appeal the decision if that is what we do for the station.

I appreciate your concern and it will be taken into consideration

From: Primosch, Lawrence [mailto:lprimosc@blm.gov]
Sent: Saturday, June 01, 2013 03:12 PM
To: VanWagoner, William; Adams, Martin; Steven Nelson <snelson@blm.gov>
Subject: LADWP Ltr 5-17-2013 GBUAPCD ROW App for Dirty Sock and Mill Air Mont Station

HI Martin and Bill! Got your letter on this proposal and here's a brief response to the 4 points.

1. We can amend an existing ROW held by GBUAPCD for additional sites. We are not moving the Shell Cut and Flat Rock sites we are adding additional ones to an existing ROW authorization..

We have done this for various LADWP projects, such as, roads, diversion dams and channels, weirs, powerlines, and monitoring sites;. Different locations for similar types of facilities does not require separate ROW documents. It is determined on a case by case basis.

2. We have not begun to process this application and when we do, we will do an EA for the proposal, just like we do for your projects.

3. We are responding to an app from GBUAPCD, we would not adjudicate whether their faciliity application meets the SIP or EPA siting criteria. That is Great Basin's problem not the BLM's.

4. Same as No 4. whether the stations and location comply with EPA;s quality assurance criteria, that is really Great Basin's problem not the BLM's.

It would appear that #3 and #4 are something that needs to be discussed with you and GBUAPCD so that they are aware of your concerns.

If you wish to have discussions with GBUAPCD, LADWP and the BLM; please set up a conference call or meeting to discuss this project. Call me 760 872 5031.

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Part 51

[AH-FRL-7478-3]

RIN 2060-AF01

Revision to the Guideline on Air Quality Models: Adoption of a Preferred Long Range Transport Model and Other Revisions

AGENCY: Environmental Protection Agency (EPA).

ACTION: Final rule.

SUMMARY: EPA's *Guideline on Air Quality Models* ("*Guideline*") addresses the regulatory application of air quality models for assessing criteria pollutants under the Clean Air Act. In today's action we promulgate several additions and changes to the *Guideline*. We adopt a new dispersion model, CALPUFF, in appendix A of the *Guideline*. CALPUFF becomes the preferred technique for assessing long range transport of pollutants and their impacts on Federal Class I areas. Action on AERMOD and the Emissions and Dispersion Modeling System (EDMS) is deferred. We make various editorial changes to update and reorganize information, and remove obsolete models.

DATES: This rule is effective May 15, 2003. Beginning April 15, 2003 the new model (*i.e.*, CALPUFF) *should be* used for its intended purposes, in accordance with today's document. The period before required implementation of a new model allows user's sufficient time to prepare meteorological data bases and to become familiar with model operation. The new model *may be* used sooner, if desired.

ADDRESSES: All documents relevant to this rule have been placed in Docket No. A-99-05 at the following address: EPA Docket Center, (EPA/DC) EPA West (MC 6102T), 1301 Constitution Ave., NW., Washington, DC. The EPA Docket Center Public Reading Room (B102) is open from 8:30 a.m. to 4:30 p.m., Monday through Friday, excluding legal holidays. The telephone number for the Air Docket is (202) 566-1742.

FOR FURTHER INFORMATION CONTACT: Joseph A. Tikvart, Leader, Air Quality Modeling Group (MD-14), Office of Air Quality Planning and Standards, U.S. Environmental Protection Agency, Research Triangle Park, NC 27711; telephone (919) 541-5562 (*Tikvart.Joe@epa.gov*).

SUPPLEMENTARY INFORMATION:

I. General Information

A. How Can I Get Copies of Related Information?

EPA established an official public docket for this action under Docket ID No. A-99-05. The official public docket is the collection of materials that is available for public viewing at the Air Docket in the EPA Docket Center, (EPA/DC) EPA West (MC 6102T), 1301 Constitution Ave., NW., Washington, DC. The EPA Docket Center Public Reading Room (B102) is open from 8:30 a.m. to 4:30 p.m., Monday through Friday, excluding legal holidays. The telephone number for the Reading Room is (202) 566-1744, and the telephone number for the Air Docket is (202) 566-1742.

Our Air Quality Modeling Group maintains an Internet Web site (Support Center for Regulatory Air Models—SCRAM) at: *http://www.epa.gov/scram001*. You may find codes and documentation for models referenced in today's action on the SCRAM Web site. We have also uploaded various support documents (*e.g.*, evaluation reports).

II. Background

The *Guideline* is used by EPA, States, and industry to prepare and review new source permits and State Implementation Plan revisions. The *Guideline* is intended to ensure consistent air quality analyses for activities regulated at 40 CFR 51.112, 51.117, 51.150, 51.160, 51.166, and 52.21. We originally published the *Guideline* in April 1978 and it was incorporated by reference in the regulations for the Prevention of Significant Deterioration (PSD) of Air Quality in June 1978. We revised the *Guideline* in 1986, and updated it with supplement A in 1987, supplement B in July 1993, and supplement C in August 1995. We published the *Guideline* as appendix W to 40 CFR part 51 when we issued supplement B. We republished the *Guideline* in August 1996 (61 FR 41838) to adopt the CFR system for labeling paragraphs. On April 21, 2000 we published proposed revisions in the **Federal Register** (65 FR 21506), which is the basis for today's promulgation.

Today's notice promulgates those components of the proposal that were clearly supported by public comments and that were otherwise not controversial, notably:

- Adoption of CALPUFF in appendix A, as proposed, for assessing long range transport of pollutants and their impacts on Federal Class I areas;
- Removal of the Climatological Dispersion Model (CDM), RAM and the Urban Airshed Model (UAM) from appendix A, as proposed;
- Simplification of complex terrain screening techniques in section 5;
- Revision of section 9 to reflect our October 1997 settlement with the Utility Air Regulatory Group regarding specification of emissions from background sources, as proposed;
- Updating information in appendix W and reorganizing its structure; and
- Transfer of appendix B and appendix C to our Web site, as proposed.

The proposal also included (1) adopting AERMOD[1] to replace the Industrial Source Complex (ISC3) model in many assessments that now use it, (2) revising ISC3 by incorporating a new downwash algorithm (PRIME) and renaming the model ISC-PRIME, and (3) updating the Emissions Dispersion Modeling System (EDMS) by incorporating improved emissions and dispersion modules. Regarding AERMOD, nearly every commenter urged EPA to integrate aerodynamic downwash into AERMOD (*i.e.*, not to require two models for some analyses). The only cautions were associated with the need for documentation, evaluation and review of the downwash enhancement to AERMOD. As a result of AERMIC's (the American Meteorological Society (AMS)/ EPA Regulatory Model Improvement Committee) efforts to revise AERMOD, incorporating the PRIME algorithm and making a few other incidental modifications and to respond to the public's cautions, we believe that AERMOD, as modified for downwash, merits another public examination of performance results. Also, since the April 2000 proposal, the Federal Aviation Administration decided to configure EDMS3.1 to incorporate the AERMOD dispersion model, and results of its performance with AERMOD only recently became available. Consequently, AERMOD and EDMS4.0, as well as other conforming changes for the *Guideline*, will be reconsidered in a Supplemental Notice of Proposed Rulemaking (SNPR) in the near future. Note that since AERMOD is not included in today's promulgation, the proposed merger of the *Guideline's* sections 4 and 5 will be deferred to AERMOD's adoption in the future.

III. Public Hearing on the Proposal

We held the 7th Conference on Air Quality Modeling (7th conference) in Washington, DC on June 28-29, 2000. As required by section 320 of the Clean Air Act, these conferences take place

[1] *AMS/EPA Regulatory MODel.*

approximately every three years to standardize modeling procedures. This conference served as the forum for receiving public comments on the *Guideline* revisions proposed in April 2000. The 7th conference featured presentations in several key modeling areas that support the revisions promulgated today. A presentation by the Interagency Workgroup on Air Quality Modeling (IWAQM[2]) covered long range transport modeling for point sources. This presentation was followed by a critical review/discussion of the CALPUFF modeling system and available performance evaluations, facilitated jointly by the Air & Waste Management Association's AB–3 Committee and the American Meteorological Society's Committee of Meteorological Aspects of Air Pollution.

We asked the public to address the following questions:

- Has the scientific merit of the models presented been established?
- Are the models' accuracy sufficiently documented?
- Are the proposed regulatory uses of individual models for specific applications appropriate and reasonable?
- Do significant implementation issues remain or is additional guidance needed?
- Are there serious resource constraints imposed by modeling systems presented?
- What additional analyses or information are needed?

We placed a transcript of the 7th conference proceedings and a copy of all written comments, which embody answers to the above questions, in Docket No. AQM–95–01.

IV. Discussion of Public Comments and Issues

All comments submitted to Docket No. A–99–05 are filed in Category IV–D. We summarized these comments, developed detailed responses, and drew conclusions on appropriate actions for today's action in the summary of public comments and EPA responses.[3] In this document, we considered and discussed all significant comments. Whenever the comments revealed any new information or suggested any alternative solutions, we considered such in our final action.

The remainder of this preamble section provides an overview of the primary issues encountered by the Agency during the public comment period and summarizes our response-to-comments.[3] This overview also serves to explain the changes to the *Guideline* in today's action, and the main technical and policy concerns addressed by the Agency. Guidance and editorial changes associated with the resolution of these issues are adopted in the appropriate sections of the *Guideline*. While modeling by its nature involves approximation based on scientific methodology, and entails utilization of advanced technology as it evolves, we believe these changes respond to recent advances in the area so that the *Guideline* continues to reflect the best and most proven of the publicly available models and analytical techniques, as well as to reflect reasonable policy choices.

CALPUFF

CALPUFF is a Lagrangian dispersion model that simulates pollutant releases as a continuous series of *puffs*. Preceding our proposal to adopt CALPUFF in the *Guideline*, IWAQM carefully studied the potential regulatory application of CALPUFF in its Phase 1 report[4] and in its Phase 2 report.[5]

In our April 2000 Federal Register notice, we proposed adoption of the CALPUFF modeling system, developed by Earth Tech, Inc., for refined use in modeling long range transport and dispersion to characterize reasonably attributable impacts from one or a few sources for PSD Class I impacts. We also proposed use of CALPUFF for those applications involving complex wind regimes, with case-by-case justification. We sought comments on the use of CALPUFF for these applications, as well as on related uses of meteorological information, *e.g.*, on use of prognostic mesoscale meteorological models and the length of record for meteorological data.

Scientific merits and accuracy. In public comments there was a general consensus that the technical basis of the CALPUFF modeling system has merit and provides substantial capabilities to not only address long range transport, but to address transport and dispersion effects in some complex wind situations.

Commenters generally agreed that the CALPUFF modeling system has adequate accuracy for use in the 50–200km range, with some studies showing that acceptable results can be achieved at least out to 200 to 300km. Since the 7th Modeling Conference, enhancements were made to CALPUFF that allow puffs to be split both horizontally (to address wind direction shear) and vertically (to address spatial variation in meteorological conditions). These enhancements likely will extend the system's ability to treat transport and dispersion beyond 300km.

With respect to accuracy for complex wind situations, we believe that the commenters agreed with our proposal to promote use of CALPUFF for complex winds with prior approval by the reviewing authority. CALPUFF has been demonstrated to perform as well as, or better than, other short-range plume dispersion models for a few cases involving complex winds, several with wind fields that are dominated by terrain effects. Some suggested a need for more testing of CALPUFF, prior to accepting its results in all cases involving complex wind situations. We intend to post on our Web site citations to investigations for any cases involving complex winds as they become available, and to build a knowledge base from which determinations can be made on the use of CALPUFF for various complex wind situations. This will support consideration of new field study comparisons as they become available. For the reasons stated above, it is apparent that CALPUFF contains the scientific basis for more appropriately addressing long range transport and dispersion effects in complex wind situations than do standard plume models.

We conclude that, although the scientific advancements will continue to emerge, CALPUFF in its current configuration is suitable for regulatory use for long range transport, and on a case-by-case basis for complex wind situations. We will require approval to be obtained prior to accepting CALPUFF for complex wind situations, as this will ensure that a *protocol* is agreed to between the parties involved, and that all are willing to accept the results as binding. As experience is gained in using CALPUFF for complex wind

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[2] IWAQM was formed in 1991 to provide a focus for development of technically sound air quality models for regulatory assessments of long range transport of pollutant source impacts on federal Class I areas. IWAQM is an interagency collaboration that includes efforts by EPA, U.S. Forest Service, National Park Service, and Fish and Wildlife Service.

[3] Summary of Public Comments and EPA Responses 7th Conference on Air Quality Modeling, Washington, D.C., June 2000 (Air Docket A–99–05, Item V–C–1). This document may also be examined from EPA's SCRAM Web site (*http://www.epa.gov/scram001*). Note that comments/responses re: AERMOD & EDMS are deferred to a companion document to be released when the SNPR is published.

[4] Environmental Protection Agency. 1993. Interagency Workgroup on Air Quality Modeling (IWAQM) Phase I report: Interim Recommendation for Modeling Long range Transport and Impacts on Regional Visibility; EPA Publication No. EPA–454/R–93–015.

[5] Environmental Protection Agency, 1998. Interagency Workgroup on Air Quality Modeling (IWAQM) Phase 2 Summary Report and Recommendations for Modeling Long-Range Transport Impacts. EPA Publication No. EPA–454/R–98–019.

situations, acceptance will become clear and those cases that are problematic will be better identified. As suggested by comments, we have removed reference to WYNDvalley from the *Guideline*.

Implementation issues/additional guidance. Some comments suggested that the CALMET (meteorological preprocessor for CALPUFF) and CALPUFF options should be defined for a variety of specific situations. We believe that more experience is needed before specific guidance can be offered for the variety of applications envisioned that might use the CALPUFF modeling system. We placed emphasis on (1) amplifying the available guidance information, (2) expanding the data formats for meteorological input data, and (3) making the code more robust to various choices in compilers. When sufficient experience has been attained, and it has become obvious what settings should be employed for best results for certain situations, we will promulgate expanded guidance after allowing opportunity for public review and comment. In the meantime, we will release interim guidance as it becomes available to assist users in tailoring CALPUFF for application. We have created a series of frequently asked questions (FAQ) with answers which the public can access via Earth Tech's Internet Web site: (*http://www.src.com/calpuff/calpuff1.htm*). This interim FAQ list will be extended as resources permit.

For long range transport and complex winds applications, we proposed that if only National Weather Service (NWS) or comparable standard meteorological observations are employed, then five consecutive years of data should be used. We further proposed that less than five years of data were acceptable if appropriate NWS data are merged with available mesoscale meteorological fields. These proposals were generally supported by public comments,[3] but the commenters did provide a variety of opinions about how many years of data should be minimally acceptable, ranging from 1 to 5 years. As we explained in our response-to-comments, we sought to strike a balance between the need for a sufficiently robust meteorological record to ensure results of reliable integrity, while maintaining administrative and computational burdens at a practical level. In consultation with the Regional Offices, we therefore have agreed to allow use of less than five, but at least three, years of assimilated mesoscale meteorological data. More than 3 years may lead to the objectionable computations burdens noted here, whereas less than 3 provides insufficient variation in meteorological conditions to capture the range of possible concentrations. We have also clarified that when merging NWS data with mesoscale meteorological fields, the NWS data should be shown to be relevant and appropriate.

For long range transport, we proposed use of a CALPUFF screening approach on a case-by-case basis that was first outlined in the IWAQM Phase 2 report (*op. cit.*) and was generally supported by commenters. The full scope of public comments is presented and addressed in our response-to-comments document.[3] We agree with the comments suggesting use of terrain heights for each receptor ring to be representative of the Class I areas of interest. Furthermore, to ensure an appropriate degree of flexibility, we will allow the permitting agency to decide whether it will accept the CALPUFF screening results as proposed, and in that decision process will defer to the appropriate reviewing authority to decide on the details of how the CALPUFF screen is to be implemented.

Resource constraints. The full scope of public comments is presented and addressed in our response-to-comments document.[3] There was a general sense from commenters that a skilled person having experience with CALMET can perform the required processing steps. Still some commenters encouraged us to find and promote a simplification to the CALMET meteorological processing steps. We did not support the suggestion to use screening level (ISC-like) meteorological data until such time as packaged data sets are made available. This would negate the benefits of using the system to simulate trajectories over large downwind distances, thereby undermining the purpose for which CALPUFF is intended. Although the processing steps are numerous and complex, they can be managed by competent staff.

Long range transport and complex wind situations are not trivial modeling problems. All commentors were aware that to address these situations requires more information (*e.g.*, terrain heights, land use mosaic, time and space variations in meteorological conditions) than is typical when using standard plume models. Processing the input data is a necessary but demanding task. The complexity of these situations requires a selection of options to provide the flexibility to tailor the model to specific situations. The CALPUFF system is currently configured to support a specific applied approach for long range transport, while at the same time, it has the flexibility for case-by-case applications involving complex winds.

Additional analyses. Some commenters questioned whether CALPUFF has undergone sufficient testing to secure its accuracy for assessing impacts on air quality related values (AQRVs). We believe the available testing for assessing AQRVs addresses many of these concerns. In addition, it should be recognized that the FLMs are responsible for defining the relevant AQRV's of interest and the procedures to employ to assess whether there is an adverse impact. When CALPUFF is used for a visibility impact assessment, this would likely be for a Class I AQRV assessment, and the reviewing authorities are the FLMs responsible for the management and protection of the resources for the particular Class I areas involved. The Federal Land Managers' Air Quality Related Values Work Group (FLAG) was formed in 1997 to provide a more consistent approach for FLMs to evaluate air pollution effects on their resources. In IWAQM's Phase 2 report, we indicated that EPA would use the procedures specified by the FLMs as a consequence of their deliberations (*e.g.*, in their FLAG report: *http://www.aqd.nps.gov/ard/flagfree/index.htm*). To assist permit applicants, the FLMs have provided procedures in the December 2000 (Phase I) FLAG report for performing such analyses as may be required. Included in these instructions, they have identified significance thresholds for potential adverse impacts, and methodologies for computing a visibility impact. The commenters are in fact addressing the FLAG procedures which are not the subject of today's action. To the extent that they were addressed in the response to comments developed by the FLMs in the FLAG Phase I report, we refer commenters to that document.

Criticism was also directed at CALPUFF's treatment of chemical transformations, which affect AQRVs. Specific concern was expressed about the sulfate and aqueous phase chemistry algorithms. As chronicled on the FLAG Web site (above), these procedures and criteria have been published and received review and comment. However, today's rule addresses the suitability of CALPUFF for PSD increment consumption and for complex wind situations (with case-by-case approval), not AQRV analyses.

Other Modeling Systems

Our proposal to remove UAM–IV from appendix A as a recommended model for ozone and to remove reference to ROM and RADM for regional scale applications was supported by some commenters who understood that these models were no longer state-of-the-science. Those who objected to removal of UAM–IV were concerned that the Models-3/CMAQ (Community Multi-scale Air Quality) model, as a replacement for UAM–IV, was not sufficiently tested. In fact, Models-3/CMAQ is identified as only one option among currently available models that are appropriate in simulating the highly complex ozone/PM–2.5 formation and transport processes. It is the responsibility of the appropriate control agency(ies) with jurisdiction for the model application to exercise discretion in the choice of models. Alternately, criteria for using models not in appendix A are clearly delineated in revised wording that we proposed for subsection 3.2.2 of appendix W. These options should more than mitigate concerns expressed by the commenters.

We generally agree that Models-3/CMAQ and REMSAD will continue to benefit from further evaluation and testing for use in urban/regional scale assessments of ozone and PM–2.5, and are not the only models available for these applications. The same is true of all similar regional scale models. However, CMAQ and REMSAD have been successfully subjected to peer scientific reviews and are currently undergoing performance evaluations that will extend over several years as data bases become more extensive and complete for both ozone and PM–2.5.

While comment was solicited on the need to integrate ozone and fine particle impacts (*i.e.*, the "one atmosphere" approach) for regional scale assessments, we did not receive substantial comment. Comments on integrating analyses were supportive and comments on source-specific analyses indicated that more work was needed in this area. It is clear that further developmental efforts on estimating the impact of individual sources is necessary before specific modeling requirements are identified for such applications.

Comments [3] were generally supportive of our proposal to remove appendix B (Summaries of Alternative Air Quality Models) from appendix W and maintaining it as a PDF file on our SCRAM Internet Web site. As we stated in the preamble to the notice of proposed rulemaking for this action, appendix B of the *Guideline* was created solely for the convenience of those seeking information about alternatives to the models adopted in appendix A. The models described in appendix B may or may not have been the subject of performance evaluations and their inclusion in appendix B does not confer special status or EPA sanction on their use. Conversely, the fact that a model has not been listed in appendix B carries no implication that its performance or acceptability for use is any poorer than appendix B listed models. Whether or not a model is listed, potential users will be subject to the same requirements, *i.e.*, to demonstrate that the model performs acceptably for its intended regulatory application. Because production and maintenance of appendix B information in the Code of Federal Regulations presents a substantial administrative burden for EPA and is not updated frequently enough to provide current information to potential users, we are moving the appendix B repository of alternative model summary descriptions to our Internet SCRAM Web site. This action offers the advantages of easier and less expensive maintenance, as well as more frequent updating, and is thus more likely to contain a comprehensive description of alternative models which have been brought to our attention. Similarly, the air quality checklist (formerly appendix C of the *Guideline*) will be available on the Web site as a PDF file.

The appendix B listing will therefore now appear as a list of *Alternative Models* (PDF file) on our Web site. We have clarified in its *Introduction and Availability* section that new models added to the list were/are not necessarily the subject of review upon their addition. On the other hand, it should be noted that the models identified in our proposal (*i.e.*, ADMS, SCIPUFF, OBODM, and CAMx) were included in the review process for today's action concerning the list of alternative models. At the request of the developer, we will remove MESOPUFF from appendix B since its function is replaced by CALPUFF.

Comments on the dispersion model ADMS argued that proprietary limitations on the availability of ADMS should not preclude it from having equal status with other Appendix A models and that it should be recommended in appendix A. However, as specified by *Guideline* paragraph 3.1.1(c)(vi), air quality models used in U.S. regulatory programs must be in the public domain at reasonable cost. This is because the source code needs to be open for public access and scrutiny to enable meaningful opportunity for public comment on new source permits, PSD increment consumption and SIPs. These criteria have been in place in U.S. regulatory programs since the inception of the *Guideline* and are needed to meet EPA's obligations under the CAA and the Administrative Procedure Act. Until the joint issues of availability (source code) and cost are addressed by the authors of ADMS, it is most appropriately listed as an alternative model for use on a case-by-case basis. Even if the model is justified on a case-by-case basis, users are responsible for making the model available for public review and comment for specific applications.

A similar comment regarding the puff model SCIPUFF did not consider that the model has not gone through the same extensive testing and regulatory evaluation as has CALPUFF, nor has it been as widely used as CALPUFF for regulatory applications. As has been done by CALPUFF's developers, a commitment to support public availability of SCIPUFF would have to be made by its supporter before it could be considered for adoption in appendix A.

Developers of neither ADMS nor SCIPUFF have addressed conflicts associated with multiple models for the same application in such a way as to assist EPA in resolving this issue. Moreover, we believe that neither ADMS nor SCIPUFF technically fill a particular technical need that is different from that occupied by the suite of refined dispersion models that EPA has promulgated for regulatory purposes after public review and comment.

Based on public comments and the rationale provided in our notice of proposed rulemaking, our decision to reference the ozone limiting method (OLM) and CAL3QHC for use in specific circumstances is justified.

Meteorological Data Issues

In our proposal we solicited comment on terminology and meaning of "site-specific" data and on use of surface meteorological data derived from the NWS's Automated Surface Observing System (ASOS). More specifically, we invited comment on whether the policy of modeling with the most recent 5 years of NWS meteorological data should include ASOS data and whether the period of record must be the most recent 5 years, regardless of whether it contains ASOS data.

No one provided negative comments on the use of the term "site-specific" or associated definitions as used in the proposed revisions. Thus, for the reasons discussed in the proposal, we will retain this terminology.

The majority of commenters who addressed the topic of ASOS data felt that the ASOS data were inferior for use with Gaussian models, though not all commenters agreed. With respect to the use of the most recent 5 years of meteorological data, there was some concern about the reliability of ASOS data. We revised guidance to specifically address this concern by allowing flexibility in the choice of ASOS or observer-based observations depending on which provided the most representative meteorological information.

Final Action

Today's action amends appendix W of 40 CFR part 51 as detailed below:

CALPUFF

The public comments provided constructive suggestions but did not suggest altering promulgation of the CALPUFF modeling system. We will therefore promulgate use of the CALPUFF modeling system as follows:

(A) Long Range Transport

CALPUFF will be adopted as a refined model for use in sulfur dioxide and particulate matter ambient air quality standards and PSD increment impact analyses involving (1) transport greater than 50km from one or several closely spaced sources, and (2) analyses involving a mixture of both long range and short-range source-receptor relationships in a large modeling domain (*e.g.*, several industrialized areas located along a river or valley). The screening approach outlined in the IWAQM Phase 2 report is available for use on a case-by-case basis that generally provides concentrations that are higher than those obtained using refined characterizations of the meteorological conditions.

Given the judgement and refinement involved, conducting a long range transport modeling assessment will require significant consultation with the appropriate reviewing authority, and for Class I analyses the appropriate FLM. To facilitate use of complex air quality and meteorological modeling systems, a written protocol may be considered for developing consensus in the methods and procedures to be followed.

(B) Complex Winds

(1) On a case-by-case basis, the CALPUFF modeling system may be applied for air quality estimates involving complex meteorological conditions, where the assumptions of steady-state straight-line transport both in time and space are inappropriate.

(2) In such situations, where the otherwise preferred dispersion model is found to be less appropriate, use of the CALPUFF modeling system will be in accordance with the procedures and requirements outlined in paragraph 3.2.2(e) of the *Guideline*.

The public comments provided constructive suggestions, but did not suggest altering the meteorological data requirements for refined modeling assessments using the CALPUFF modeling system. Therefore, we will promulgate use of the CALPUFF modeling system with the following meteorological data requirements. For long range transport and for complex winds situations, there are two possibilities:

(A) If only NWS or comparable standard meteorological observations are employed, then five years of meteorological data should be used.

(B) If mesoscale meteorological fields are employed with appropriate NWS observations, then less than five years but at least three years of meteorological data may be used. Following the suggestions provided in public comments, we revised the *Guideline* to emphasize that appropriate NWS observations should be used in conjunction with mesoscale meteorological data.

In response to the suggestions provided in public comments, we: (1) Created a series of frequently asked questions to provide additional technical information to users, which will be made publicly available via Earth Tech's Internet Web site, (2) expanded the meteorological and precipitation data formats that can be processed, (3) have tested and made changes as necessary that allow the modeling software to be compiled by several Fortran compilers, thus making the code more robust to various choices in compilers, and (4) will maintain and make publicly available via our Web site, a list of technical papers and reports that describe testing and evaluation of the CALPUFF modeling system in a variety of situations and thus provide a basis for wider use of the CALPUFF modeling system.

For appropriate applications, CALPUFF *may be* used during the one-year period following the promulgation of today's notice. After one year following promulgation of today's notice, CALPUFF should be used for appropriate applications.

Other Modeling Systems

We have removed UAM–IV from appendix A for urban ozone applications and removed reference to ROM and RADM for regional scale applications to reflect the current state-of-science. Similarly, we have identified Models-3/CMAQ and REMSAD as example modeling systems that have been evaluated and peer reviewed for regional scale applications, and make clear that this does not preclude the use of other models.

We have removed appendix B and appendix C from appendix W and placed equivalent counterparts on our SCRAM Internet Web site. Former appendix B will simply become a list of alternative model summaries, and should be readily updated as new models in the proper format are submitted and not on a restrictive schedule. Given the current status of ADMS and SCIPUFF, as well as OBODM, CAMx and UAMV (an update to UAM–IV), all have now been included in the web-based Alternative Models list.

As proposed, we have referenced OLM and CAL3QHC for use in specific circumstances, and removed RAM and CDM from appendix A.

Meteorological Data Issues

The terminology for "site-specific" has been implemented as proposed since there was a lack of negative comment. The prevailing concept is, as commenters recognized, *representativeness*, and this is now emphasized in our guidance.

Due to limitations of ASOS data for use with standard dispersion models, paragraph 8.3.1.2(a) of appendix W has been revised to indicate that where the latest 5 years of data includes ASOS data (now the typical situation) discretion should be used. Where judgment indicates ASOS data are inadequate for cloud cover observations, the most recent 5 years of NWS data that are observer-based may be considered for use.

In response to public comment, we have updated our meteorological data processors (*i.e.*, MPRM and CALMET) to allow processing of meteorological data formats from the National Climatic Data Center necessary to operate associated air quality models; no further updates to MPRM are necessary at this time. The meteorological monitoring guidance [6] has been updated.

Final Editorial Changes to Appendix W

Preface

You will note some minor revisions to reflect current EPA practice.

Section 2

In a streamlining effort, we removed section 2.2 and added a new section 2.3 to address model availability.

[6] Environmental Protection Agency, 2000. Meteorological Monitoring Guidance for Regulatory Modeling Applications. EPA Publication No. EPA–454/R–99–005. U.S. Environmental Protection Agency, Research Triangle Park, NC. (*www.epa.gov/scram001*).

Section 3

As proposed, we revised section 3 to more accurately reflect current EPA practice, *e.g.*, functions of the Model Clearinghouse and enhanced criteria for the use of alternative models. Requirements for alternative models when preferred models are less appropriate for specific applications have been clarified. These requirements include scientific peer review and the establishment of an acceptable protocol prior to the model's use.

Section 4

We revised section 4.2.2 to reflect the widespread use of short-term models for all averaging periods. Hence, we no longer reference long-term models (*e.g.*, ISCLT) in the *Guideline*.[7]

Section 5

To simplify, the list of acceptable, yet equivalent, screening techniques for complex terrain was removed. CTSCREEN and guidance for its use are retained; CTSCREEN remains acceptable for all terrain above stack top. The screening techniques whose descriptions we removed, *i.e.*, Valley (as implemented in SCREEN3), COMPLEX I (as implemented in ISC3), SHORTZ/LONGZ, and RTDM remain available for use in applicable cases where established/accepted procedures are used. Consultation with the appropriate reviewing authority is still advised for application of these screening models.

Section 6

As proposed, we revised section 6 to reflect the new PM–2.5 and ozone ambient air quality standards that were issued on July 18, 1997 (62 FR 38652 & 62 FR 38856). You will note that we inserted respective subsections for particulate matter and lead from section 8, so that section 6 now primarily contains modeling guidance for the criteria pollutants regulated in Part 51 (SO2 analyses are covered in section 4). We also updated information on receptor models.

• We enhanced the subsection on particulate matter as much as possible to reflect the Agency's current thinking on approaches for fine particulates (PM–2.5). You will note that we removed the references to the Climatological Dispersion Model (CDM 2.0) as well as to RAM from this section, and also deleted CDM and RAM from appendix A (*see* below).

• We enhanced the subsection on ozone to better reflect modeling approaches we currently envision, and added a reference for current guidance on ozone attainment demonstrations.[8] You will note that we removed the reference to the Urban Airshed Model (UAM–IV) from this section, and deleted UAM from appendix A. UAM–IV is no longer the recommended photochemical model for attainment demonstrations for ozone.

• We updated the subsection on carbon monoxide by removing reference to RAM. While UAM–IV is deleted from appendix A, reference to areawide analyses is retained. For refined intersection modeling, CAL3QHCR is specifically mentioned for use on a case-by-case basis.

• In the subsection on NO_2 models, we added a third tier for the screening approach that allows the use of the ozone limiting method on a case-by-case basis. You may recall that this approach was removed with the *Guideline* update promulgated on August 9, 1995 (60 FR 40465).

• In the subsection on lead, we deleted references to 40 CFR 51.83, 51.84, and 51.85, conforming to previous EPA action (51 FR 40661).

Section 7

For regional scale modeling, we removed reference to the Regional Oxidant Model (ROM) and the Regional Acid Deposition Model (RADM) from section 7 because they are outdated and replaced by a reference to Models-3[9] in section 8. We enhanced the subsection on visibility to reflect the provisions of the Clean Air Act, including those for reasonable attribution of visibility impairment and regional haze, as well as the new NAAQS for PM–2.5. For assessment of reasonably attributable haze impairment due to one or a small group of sources, CALPUFF is available for use on a case-by-case basis. We identify REMSAD and new approaches under the Models-3/CMAQ umbrella for possible use to develop and evaluate national policy and assist State and local control agencies. For long range transport analyses, we recommend the CALPUFF modeling system. To facilitate use of a complex air quality and meteorological modeling system like CALPUFF, we stipulate that a written protocol may be considered for developing consensus in the methods and procedures to be followed.

Section 8

As proposed, we revised section 8 to better reflect our current regulatory practice for the general modeling considerations addressed.

• We revised subsection 8.2.6 to refer to subsection 6.2.3 for details on chemical transformation of NO_X.

• We merged subsection 8.2.8 (Urban/Rural Classification) with subsection 8.2.3 (Dispersion Coefficients), and removed reference to WYNDvalley.

• We merged discussions in subsections 8.2.9 (Fumigation) and 8.2.10 (Stagnation) into one new subsection (8.2.8—Complex Winds), and specifically identify the availability of CALPUFF for certain situations on a case-by-case basis.

• We removed the distinction between short-term and long-term models because when assessing the impacts from criteria air pollutants, long-term estimates are now practicable using hour-by-hour meteorological data.

Section 9

As proposed,

• We revised subsection 9.2.3 (recommendations for estimating background concentrations from nearby sources) to reflect a settlement reached on October 16, 1997 in a petition brought by the Utility Air Regulatory Group (UARG). In accordance with the settlement, we are clarifying the definition of "nearby sources." The "maximum allowable emission limit," specified in Tables 9–1 and 9–2, is tied in certain circumstances[10] to the emission rate representative of a nearby source's maximum physical capacity to emit. We also clarify that nearby sources should be modeled only when they operate at the same time as the primary source(s) being modeled. Where a nearby source does not, by its nature, operate at the same time as the primary source being modeled, the burden is on the primary source to demonstrate to the satisfaction of the appropriate reviewing authority that this is, in fact, the case. We added footnotes to Tables 9–1 and 9–2 to refer back to applicable paragraphs of subsection 9.2.3 that provide the necessary clarification.

[7] Note that because appendix W is designed to guide assessments for criteria pollutants, the proposed discontinuation of ISCLT for purposes herein does not preclude its use for other pollutant assessments, as applicable. For example, the ASPEN model (Assessment System for Population Exposure Nationwide) uses the capabilities of ISCLT to estimate ambient concentrations of toxic pollutants nationwide by census tract. Such applications require the abbreviated computing possible with ISCLT.

[8] Environmental Protection Agency, 1998. Use of Models and Other Analyses in Attainment Demonstrations for the 8-hr Ozone NAAQS (Draft). Office of Air Quality Planning & Standards, Research Triangle Park, NC. (Docket No. A–99–05, II–A–14) (Also available on SCRAM Web site, *http://www.epa.gov/scram001, as draft8hr.pdf*)

[9] Environmental Protection Agency, 1998. EPA Third-Generation Air Quality Modeling System. Models-3, Volume 9b: User Manual. EPA Publication No. EPA–600/R–98/069(b). Office of Research and Development, Washington, DC.

[10] See section 8.2.3 of the *Guideline*.

• We enhanced section 9.3 (Meteorological Input Data) to develop concepts of meteorological data representativeness, minimum meteorological data requirements, and the use of prognostic mesoscale meteorological models in certain situations. These models (*e.g.*, the Penn State/NCAR MM4 [11,12,13] or MM5 [14] model) assimilate meteorological data from several surface and upper air stations in or near a domain and generate a 3-dimensional field of wind, temperature and relative humidity profiles. We revised recommendations for length of record for meteorological data (subsection 9.3.1.2) for long range transport and complex wind situations. In paragraph 9.3.1.2(d) we specifically allow the use of at least three years (need not be consecutive) of assimilated mesoscale meteorological data.

• We revised subsection 9.3.2 (National Weather Service Data) to inform users that National Weather Service (NWS) surface and upper air meteorological data are available on CD–ROM from the National Climatic Data Center. Recent years of such surface data are derived from the NWS's Automated Surface Observing System (ASOS). We revised subsection 9.3.1.2 to address the possible occurrence of ASOS data within 5-year sets of meteorological data.

• We revised subsection 9.3.3.1 to clarify that, while site-specific measurements are frequently made "on-property" (*i.e.*, on the source's premises), acquisition of adequately representative site-specific data does not preclude collecting data from a location off property. Conversely, collection of meteorological data on property does not of itself guarantee adequate representativeness. The subsection was also enhanced by improving the discussion of collection of temperature difference measurements; a paragraph was developed that focuses on measurement of aloft winds for simulation of plume rise, dispersion and transport (some details for CTDMPLUS were moved to its appendix A descriptions); a paragraph was added to address collection and use of direct turbulence measurements; and the paragraph that discusses meteorological data preprocessor has been enhanced.

• We revised subsection 9.3.3.2 by removing reference to the STAR processing routine because ISCLT and CDM 2.0 (for which STAR formatted data were developed) have been removed.

• We revised subsection 9.3.4 (Treatment of Calms) to increase accuracy.

Section 10

We updated section 10 to reflect current thinking and state-of-the-practice regarding model accuracy and uncertainty.

Section 11

As proposed, we made minor revisions to section 11 to reflect the new ambient air quality standards for fine particles and ozone. Because EPA has revised its emissions trading program for SO_2, we have deleted subsection 11.2.3.4.

Section 12 & 13

We redesignated section 13 (Bibliography) as section 12 (References) and *vice-versa*. We revised them by adding some references, deleting obsolete/superseded ones, and resequencing. You will note that a peer scientific review for CALPUFF has been included.

Section 14

In a streamlining effort, we removed section 14 (Glossary). Given current familiarity with modeling terminology, we no longer consider that maintenance of such a glossary is as necessary as it once may have been. For these and other reasons relating to Office of Federal Register policy (see discussion of appendix B below), we have revised the glossary and placed it on our Internet Web site.

Appendix A

We updated the introduction to appendix A (section A.0). As mentioned before, we added CALPUFF to appendix A. We removed the Climatological Dispersion Model (CDM 2.0), the Gaussian-Plume Multiple Source Air Quality Algorithm (RAM), and the Urban Airshed Model (UAM) from appendix A. These models have been superseded and are no longer considered preferred techniques.

Appendix B

We have moved the appendix B repository of alternate model summary descriptions to our Internet SCRAM Web site (*http://www.epa.gov/scram001*). Placement of this material on the Web site offers many advantages. In this format, we will be able to maintain the list and model descriptions more easily and inexpensively.

Several model developers have submitted new dispersion models for inclusion in this Web site repository of alternate models:

• Second-Order Closure Integrated Puff Model (SCIPUFF);

• Open Burn/Open Detonation Dispersion Model (OBODM);

• Atmospheric Dispersion Modeling System (ADMS);

• Comprehensive Air Quality Model with extensions (CAMx); and

• Urban Airshed Model—V (UAMV).

As described below, codes (executables) for these models, as well as applicable documentation, have been uploaded to our Internet SCRAM Web site. Finally, we deleted a model currently listed in appendix B, MESOPUFF II, which CALPUFF replaces.

Appendix C

As proposed, we also moved appendix C (Example Air Quality Analysis Checklist) from the CFR to our Internet SCRAM Web site. We believe this checklist is outdated, in need of revision, and would be more practical to maintain if posted on EPA's Internet SCRAM Web site.

Statutory and Executive Order Reviews

A. Executive Order 12866: Regulatory Planning and Review

Under Executive Order 12866 (58 FR 51735 (October 4, 1993)), the Agency must determine whether the regulatory action is "significant" and therefore subject to review by the Office of Management and Budget (OMB) and the requirements of the Executive Order. The Order defines "significant regulatory action" as one that is likely to result in a rule that may:

(1) Have an annual effect on the economy of $100 million or more or adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, public health or safety, or State, local, or tribal governments or communities;

(2) Create a serious inconsistency or otherwise interfere with an action taken or planned by another agency;

(3) Materially alter the budgetary impact of entitlements, grants, user fees,

[11] Stauffer, D.R. and Seaman, N.L., 1990. Use of four-dimensional data assimilation in a limited-area mesoscale model. Part I: Experiments with synoptic-scale data. Monthly Weather Review, 118: 1250–1277.

[12] Stauffer, D.R., Seaman, N.L., and Binkowski, F.S., 1991. Use of four-dimensional data assimilation in a limited-area mesoscale model. Part II: Effect of data assimilation within the planetary boundary layer. Monthly Weather Review, 119: 734–754.

[13] Hourly Modeled Sounding Data. MM4—1990 Meteorological Data, 12-volume CD–ROM. Jointly produced by NOAA's National Climatic Data Center and Atmospheric Sciences Modeling Division. August 1995. Can be ordered from NOAA National Data Center's Internet Web site @ *www.nndc.noaa.gov/*.

[14] *http://www.mmm.ucar.edu/mm5/mm5-home.html*

or loan programs of the rights and obligations of recipients thereof; or

(4) Raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in the Order.

This rule is not a "significant regulatory action" under the terms of Executive Order 12866 and is therefore not subject to OMB review.

B. Paperwork Reduction Act

This final rule does not contain any information collection requirements subject to review by OMB under the Paperwork Reduction Act, 44 U.S.C. 3501 *et seq.*

C. Regulatory Flexibility Act (RFA), as amended by the Small Business Regulatory Enforcement Fairness Act of 1996 (SBREFA), 5 U.S.C. 601 et seq.

The RFA generally requires an agency to prepare a regulatory flexibility analysis of any rule subject to notice and comment rulemaking requirements under the Administrative Procedure Act or any other statute unless the agency certifies that the rule will not have a significant economic impact on a substantial number of small entities. Small entities include small businesses, small organizations, and small governmental jurisdictions.

EPA has determined that it is not necessary to prepare a regulatory flexibility analysis in connection with this final rule. EPA has also determined that this rule will not have a significant economic impact on a substantial number of small entities. For purposes of assessing the impact of today's rule on small entities, small entities are defined as: (1) A small business that meets the RFA default definitions for small business (based on Small Business Administration size standards), as described in 13 CFR 121.201; (2) a small governmental jurisdiction that is a government of a city, county, town, school district or special district with a population of less than 50,000; and (3) a small organization that is any not-for-profit enterprise which is independently owned and operated and is not dominant in its field.

After considering the economic impacts of today's final rule on small entities, EPA has concluded that this action will not have a significant economic impact on a substantial number of small entities. This final rule will not impose any requirements on small entities. Today's rule will not have any impacts on small entities because existing and new sources of air emissions that model air quality for State Implementation Plans and the prevention of significant deterioration are typically not small entities. The modeling techniques described today are primarily used by state air control agencies and by industry.

To the extent that any small entities would ever have to model air quality using the modeling techniques described in today's rule, the impacts of using updated modeling techniques would be minimal, if not non-existent. The action promulgated today incorporates comments received at the 7th Conference on Air Quality Modeling in June 2000 in Washington, DC. The rule features a new modeling system for calculating PSD increment consumption—CALPUFF—and serves to increase efficiency and accuracy. This system employs procedural concepts that are very similar to those currently used, changing only mathematical formulations and specific data elements. No impacts on small entities in the use of CALPUFF are anticipated. We do not believe that CALPUFF's use poses a significant or unreasonable burden on any small entities. This final action imposes no new regulatory burdens and, as such, there will be no additional impact on small entities regarding reporting, recordkeeping, compliance requirements.

D. Unfunded Mandates Reform Act of 1995

Title II of the Unfunded Mandates Reform Act of 1995 (UMRA), Public Law 104–4, establishes requirements for Federal agencies to assess the effects of their regulatory actions on State, local, and tribal governments and the private sector. Under section 202 of the UMRA, EPA generally must prepare a written statement, including a cost-benefit analysis, for proposed and final rules with "Federal mandates" that may result in expenditures to State, local, and tribal governments, in the aggregate, or to the private sector, of $100 million or more in any one year. Before promulgating an EPA rule for which a written statement is needed, section 205 of the UMRA generally requires EPA to identify and consider a reasonable number of regulatory alternatives and adopt the least costly, most cost-effective or least burdensome alternative that achieves the objectives of the rule. The provisions of section 205 do not apply when they are inconsistent with applicable law. Moreover, section 205 allows EPA to adopt an alternative other than the least costly, most cost-effective or least burdensome alternative if the Administrator publishes with the final rule an explanation why that alternative was not adopted. Before EPA establishes any regulatory requirements that may significantly or uniquely affect small governments, including tribal governments, it must have developed under section 203 of the UMRA a small government agency plan.

The plan must provide for notifying potentially affected small governments, enabling officials of affected small governments to have meaningful and timely input in the development of EPA regulatory proposals with significant Federal intergovernmental mandates, and informing, educating, and advising small governments on compliance with the regulatory requirements.

Today's rule recommends a new modeling system for calculating PSD increment consumption—CALPUFF—that increases efficiency and accuracy. CALPUFF has been used for these purposes on a case-by-case basis (per *Guideline subsection* 3.2.2) for several years, as has its predecessor—MESOPUFF II. While *Guideline subsection* 3.2.2 still allows for alternative models to be used, EPA is now sufficiently confident in CALPUFF's technical formulation and performance to adopt it in appendix A of the *Guideline*. Since the two modeling systems are comparable in scope and purpose, use of CALPUFF itself does not involve any increase in costs. The optional use of prognostic meteorological data (*e.g.*, MM5) input files, however, may result in a small incremental cost increase. To the extent that the use of more refined models with comprehensive input data bases reduces the potential for over-or underprediction of air quality impacts, air quality management programs become more economically efficient. Moreover, modeling costs (which include those for input data acquisition) are typically among the implementation costs that are considered as part of the programs (*i.e.*, PSD) that establish and periodically revise requirements for compliance. Any incremental modeling costs attributable to today's rule do not approach the $100 million threshold prescribed by UMRA. EPA has determined that this rule contains no regulatory requirements that might significantly or uniquely affect small governments. This rule therefore contains no Federal mandates (under the regulatory provisions of Title II of the UMRA) for State, local, or tribal governments or the private sector.

E. Executive Order 13132: Federalism

Executive Order 13132, entitled "Federalism " (64 FR 43255, August 10, 1999), requires EPA to develop an accountable process to ensure "meaningful and timely input by State and local officials in the development of regulatory policies that have federalism implications." "Policies that have federalism implications " is defined in the Executive Order to include regulations that have "substantial direct effects on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government."

This final rule does not have federalism implications. It will not have substantial direct effects on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government, as specified in Executive Order 13132. This rule does not create a mandate on State, local or tribal governments. The rule does not impose any enforceable duties on these entities (see D. Unfunded Mandates Reform Act of 1995, above). The rule would add better, more accurate techniques for air dispersion modeling analyses and does not impose any additional requirements for any of the affected parties covered under Executive Order 13132. Thus, Executive Order 13132 does not apply to this rule.

F. Executive Order 13175: Consultation and Coordination With Indian Tribal Governments

Executive Order 13175, entitled "Consultation and Coordination with Indian Tribal Governments" (65 FR 67249, November 9, 2000), requires EPA to develop an accountable process to ensure "meaningful and timely input by tribal officials in the development of regulatory policies that have tribal implications." This final rule does not have tribal implications, as specified in Executive Order 13175. As stated above (see D. Unfunded Mandates Reform Act of 1995, above), the rule does not impose any new requirements for calculating PSD increment consumption, and does not impose any additional requirements for the regulated community, including Indian Tribal Governments. Thus, Executive Order 13175 does not apply to this rule.

Today's final rule does not significantly or uniquely affect the communities of Indian tribal governments. Accordingly, the requirements of section 3(b) of Executive Order 13175 do not apply to this rule.

G. Executive Order 13045: Protection of Children From Environmental Health and Safety Risks

Executive Order 13045 applies to any rule that EPA determines (1) to be "economically significant " as defined under Executive Order 12866, and (2) the environmental health or safety risk addressed by the rule has a disproportionate effect on children. If the regulatory action meets both the criteria, the Agency must evaluate the environmental health or safety effects of the planned rule on children; and explain why the planned regulation is preferable to other potentially effective and reasonably feasible alternatives considered by the Agency.

This final rule is not subject to Executive Order 13045, entitled "Protection of Children from Environmental Health Risks and Safety Risks " (62 FR 19885, April 23, 1997) because it does not impose an economically significant regulatory action as defined by Executive Order 12866 and the action does not involve decisions on environmental health or safety risks that may disproportionately affect children.

H. Executive Order 13211: Actions that Significantly Affect Energy Supply, Distribution, or Use

This rule is not subject to Executive Order 13211, "Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use" (66 FR 28355 (May 22, 2001)) because it is not a significant regulatory action under Executive Order 12866.

I. National Technology Transfer and Advancement Act of 1995

Section 12(d) of the National Technology Transfer and Advancement Act of 1995 ("NTTAA"), Public Law 104–113, section 12(d) (15 U.S.C. 272 note) directs EPA to use voluntary consensus standards in its regulatory activities unless to do so would be inconsistent with applicable law or otherwise impractical. Voluntary consensus standards are technical standards (*e.g.*, materials specifications, test methods, sampling procedures, and business practices) that are developed or adopted by voluntary consensus standards bodies. The NTTAA directs EPA to provide Congress, through OMB, explanations when the Agency decides not to use available and applicable voluntary consensus standards.

This action does not involve technical standards. Therefore, EPA did not consider the use of any voluntary consensus standards.

J. Congressional Review Act of 1998

The Congressional Review Act, 5 U.S.C. 801 *et seq.*, as added by the Small Business Regulatory Enforcement Fairness Act of 1996, generally provides that before a rule may take effect, the agency promulgating the rule must submit a rule report, which includes a copy of the rule, to each House of the Congress and to the Comptroller General of the United States. EPA will submit a report containing this rule and other required information to the U.S. Senate, the U.S. House of Representatives, and the Comptroller General of the United States prior to publication of the rule in the Federal Register. A Major rule cannot take effect until 60 days after it is published in the Federal Register. This action is not a "major rule" as defined by 5 U.S.C. 804(2), and will be effective 30 days from the publication date of this notice.

List of Subjects in 40 CFR Part 51

Environmental protection, Administrative practice and procedure, Air pollution control, Carbon monoxide, Intergovernmental relations, Nitrogen oxides, Ozone, Particulate matter, Reporting and recordkeeping requirements, Sulfur oxides.

Dated: April 2, 2003.

Christine Todd Whitman,

Administrator.

■ Part 51, chapter I, title 40 of the Code of Federal Regulations is amended as follows:

PART 51—REQUIREMENTS FOR PREPARATION, ADOPTION, AND SUBMITTAL OF IMPLEMENTATION PLANS

■ 1. The authority citation for part 51 continues to read as follows:

Authority: 23 U.S.C. 100; 42 U.S.C. 7401–7671q.

■ 2. Appendix W to Part 51 revised to read as follows:

Appendix W to Part 51—Guideline on Air Quality Models

Preface

a. Industry and control agencies have long expressed a need for consistency in the application of air quality models for regulatory purposes. In the 1977 Clean Air Act, Congress mandated such consistency and encouraged the standardization of model applications. The *Guideline on Air Quality Models* (hereafter, *Guideline*) was first published in April 1978 to satisfy these requirements by specifying models and providing guidance for their use. The *Guideline* provides a common basis for estimating the air quality concentrations of criteria pollutants used in assessing control strategies and developing emission limits.

b. The continuing development of new air quality models in response to regulatory requirements and the expanded requirements for models to cover even more complex problems have emphasized the need for periodic review and update of guidance on these techniques. Three primary on-going activities provide direct input to revisions of the *Guideline*. The first is a series of annual

EPA workshops conducted for the purpose of ensuring consistency and providing clarification in the application of models. The second activity is the solicitation and review of new models from the technical and user community. In the March 27, 1980 Federal Register, a procedure was outlined for the submittal to EPA of privately developed models. After extensive evaluation and scientific review, these models, as well as those made available by EPA, are considered for recognition in the *Guideline*. The third activity is the extensive on-going research efforts by EPA and others in air quality and meteorological modeling.

c. Based primarily on these three activities, new sections and topics are included as needed. EPA does not make changes to the guidance on a predetermined schedule, but rather on an as needed basis. EPA believes that revisions of the *Guideline* should be timely and responsive to user needs and should involve public participation to the greatest possible extent. All future changes to the guidance will be proposed and finalized in the Federal Register. Information on the current status of modeling guidance can always be obtained from EPA's Regional Offices.

Table of Contents

Appendix A to Appendix W of 40 CFR Part 51—Summaries of Preferred Air Quality Models

LIST OF TABLES

1.0 Introduction

a. The *Guideline* recommends air quality modeling techniques that should be applied to State Implementation Plan (SIP) revisions for existing sources and to new source reviews (NSR), including prevention of significant deterioration (PSD). (*See* Ref. 1, 2, 3). Applicable only to criteria air pollutants, it is intended for use by EPA Regional Offices in judging the adequacy of modeling analyses performed by EPA, State and local agencies and by industry. The guidance is appropriate for use by other Federal agencies and by State agencies with air quality and land management responsibilities. The *Guideline* serves to identify, for all interested parties, those techniques and data bases EPA considers acceptable. The *Guideline* is not intended to be a compendium of modeling techniques. Rather, it should serve as a common measure of acceptable technical analysis when supported by sound scientific judgement.

b. Due to limitations in the spatial and temporal coverage of air quality measurements, monitoring data normally are not sufficient as the sole basis for demonstrating the adequacy of emission limits for existing sources. Also, the impacts of new sources that do not yet exist can only be determined through modeling. Thus, models, while uniquely filling one program need, have become a primary analytical tool in most air quality assessments. Air quality measurements can be used in a complementary manner to dispersion models, with due regard for the strengths and weaknesses of both analysis techniques. Measurements are particularly useful in assessing the accuracy of model estimates. The use of air quality measurements alone however could be preferable, as detailed in a later section of this document, when models are found to be unacceptable and monitoring data with sufficient spatial and temporal coverage are available.

c. It would be advantageous to categorize the various regulatory programs and to apply a designated model to each proposed source needing analysis under a given program. However, the diversity of the nation's topography and climate, and variations in source configurations and operating characteristics dictate against a strict modeling "cookbook". There is no one model capable of properly addressing all conceivable situations even within a broad category such as point sources. Meteorological phenomena associated with threats to air quality standards are rarely amenable to a single mathematical treatment; thus, case-by-case analysis and judgement are frequently required. As modeling efforts become more complex, it is increasingly important that they be directed by highly competent individuals with a broad range of experience and knowledge in air quality meteorology. Further, they should be coordinated closely with specialists in emissions characteristics, air monitoring and data processing. The judgement of experienced meteorologists and analysts is essential.

d. The model that most accurately estimates concentrations in the area of interest is always sought. However, it is clear from the needs expressed by the States and EPA Regional Offices, by many industries and trade associations, and also by the deliberations of Congress, that consistency in the selection and application of models and data bases should also be sought, even in case-by-case analyses. Consistency ensures that air quality control agencies and the general public have a common basis for estimating pollutant concentrations, assessing control strategies and specifying emission limits. Such consistency is not, however, promoted at the expense of model and data base accuracy. The *Guideline* provides a consistent basis for selection of the most accurate models and data bases for use in air quality assessments.

e. Recommendations are made in the *Guideline* concerning air quality models, data bases, requirements for concentration estimates, the use of measured data in lieu of model estimates, and model evaluation procedures. Models are identified for some specific applications. The guidance provided here should be followed in air quality analyses relative to State Implementation Plans and in supporting analyses required by EPA, State and local agency air programs. EPA may approve the use of another technique that can be demonstrated to be more appropriate than those recommended in this guide. This is discussed at greater length in Section 3. In all cases, the model applied to a given situation should be the one that provides the most accurate representation of atmospheric transport, dispersion, and chemical transformations in the area of interest. However, to ensure consistency, deviations from this guide should be carefully documented and fully supported.

f. From time to time situations arise requiring clarification of the intent of the guidance on a specific topic. Periodic workshops are held with the headquarters, Regional Office, State, and local agency modeling representatives to ensure consistency in modeling guidance and to promote the use of more accurate air quality models and data bases. The workshops serve to provide further explanations of *Guideline* requirements to the Regional Offices and workshop reports are issued with this clarifying information. In addition, findings from on-going research programs, new model submittals, or results from model evaluations and applications are continuously evaluated. Based on this information changes in the guidance may be indicated.

g. All changes to the *Guideline* must follow rulemaking requirements since the *Guideline* is codified in Appendix W of Part 51. EPA will promulgate proposed and final rules in the Federal Register to amend this Appendix. Ample opportunity for public comment will be provided for each proposed change and public hearings scheduled if requested.

h. A wide range of topics on modeling and data bases are discussed in the *Guideline*. Section 2 gives an overview of models and their appropriate use. Section 3 provides specific guidance on the use of "preferred" air quality models and on the selection of alternative techniques. Sections 4 through 7 provide recommendations on modeling techniques for application to simple-terrain stationary source problems, complex terrain problems, and mobile source problems. Specific modeling requirements for selected regulatory issues are also addressed. Section 8 discusses issues common to many modeling analyses, including acceptable model components. Section 9 makes recommendations for data inputs to models including source, meteorological and background air quality data. Section 10 covers the uncertainty in model estimates and how that information can be useful to the regulatory decision-maker. The last chapter summarizes how estimates and measurements of air quality are used in assessing source impact and in evaluating control strategies.

i. Appendix W to 40 CFR Part 51 itself contains an appendix: Appendix A. Thus, when reference is made to "Appendix A" in this document, it refers to Appendix A to Appendix W to 40 CFR Part 51. Appendix A contains summaries of refined air quality models that are "preferred" for specific applications; both EPA models and models developed by others are included.

2.0 Overview of Model Use

a. Before attempting to implement the guidance contained in this document, the reader should be aware of certain general information concerning air quality models and their use. Such information is provided in this section.

2.1 Suitability of Models

a. The extent to which a specific air quality model is suitable for the evaluation of source impact depends upon several factors. These include: (1) The meteorological and topographic complexities of the area; (2) the level of detail and accuracy needed for the analysis; (3) the technical competence of those undertaking such simulation modeling; (4) the resources available; and (5) the detail and accuracy of the data base, i.e., emissions inventory, meteorological data, and air quality data. Appropriate data should be available before any attempt is made to apply a model. A model that requires detailed, precise, input data should not be used when such data are unavailable. However, assuming the data are adequate, the greater the detail with which a model considers the spatial and temporal variations in emissions and meteorological conditions, the greater the ability to evaluate the source impact and to distinguish the effects of various control strategies.

b. Air quality models have been applied with the most accuracy, or the least degree of uncertainty, to simulations of long term averages in areas with relatively simple topography. Areas subject to major topographic influences experience meteorological complexities that are extremely difficult to simulate. Although models are available for such circumstances, they are frequently site specific and resource intensive. In the absence of a model capable of simulating such complexities, only a preliminary approximation may be feasible until such time as better models and data bases become available.

c. Models are highly specialized tools. Competent and experienced personnel are an essential prerequisite to the successful application of simulation models. The need for specialists is critical when the more sophisticated models are used or the area being investigated has complicated meteorological or topographic features. A model applied improperly, or with inappropriate data, can lead to serious misjudgements regarding the source impact or the effectiveness of a control strategy.

d. The resource demands generated by use of air quality models vary widely depending on the specific application. The resources required depend on the nature of the model and its complexity, the detail of the data base, the difficulty of the application, and the amount and level of expertise required. The costs of manpower and computational facilities may also be important factors in the selection and use of a model for a specific analysis. However, it should be recognized that under some sets of physical circumstances and accuracy requirements, no present model may be appropriate. Thus, consideration of these factors should lead to selection of an appropriate model.

2.2 Levels of Sophistication of Models

a. There are two levels of sophistication of models. The first level consists of relatively simple estimation techniques that generally use preset, worst-case meteorological conditions to provide conservative estimates of the air quality impact of a specific source, or source category. These are called screening techniques or screening models. The purpose of such techniques is to eliminate the need of more detailed modeling for those sources that clearly will not cause or contribute to ambient concentrations in excess of either the National Ambient Air Quality Standards (NAAQS)[4] or the allowable prevention of significant deterioration (PSD) concentration increments.[2,3] If a screening technique indicates that the concentration contributed by the source exceeds the PSD increment or the increment remaining to just meet the NAAQS, then the second level of more sophisticated models should be applied.

b. The second level consists of those analytical techniques that provide more detailed treatment of physical and chemical atmospheric processes, require more detailed and precise input data, and provide more specialized concentration estimates. As a result they provide a more refined and, at least theoretically, a more accurate estimate of source impact and the effectiveness of control strategies. These are referred to as refined models.

c. The use of screening techniques followed, as appropriate, by a more refined analysis is always desirable, however there are situations where the screening techniques are practically and technically the only viable option for estimating source impact. In such cases, an attempt should be made to acquire or improve the necessary data bases and to develop appropriate analytical techniques.

2.3 Availability of Models

a. For most of the screening and refined models discussed in the *Guideline*, codes, associated documentation and other useful information are available for download from EPA's Support Center for Regulatory Air Modeling (SCRAM) Internet Web site at *http://www.epa.gov/scram001*. A list of alternate models that can be used with case-by-case justification (subsection 3.2) and an example air quality analysis checklist are also posted on this Web site. This is a site with which modelers should become familiar.

3.0 Recommended Air Quality Models

a. This section recommends the approach to be taken in determining refined modeling techniques for use in regulatory air quality programs. The status of models developed by EPA, as well as those submitted to EPA for review and possible inclusion in this guidance, is discussed. The section also addresses the selection of models for individual cases and provides recommendations for situations where the preferred models are not applicable. Two additional sources of modeling guidance are the Model Clearinghouse and periodic Regional/State/Local Modelers workshops.

b. In this guidance, when approval is required for a particular modeling technique or analytical procedure, we often refer to the "*appropriate reviewing authority*". In some EPA regions, authority for NSR and PSD permitting and related activities has been delegated to State and even local agencies. In these cases, such agencies are "*representatives*" of the respective regions. Even in these circumstances, the Regional Office retains the ultimate authority in decisions and approvals. Therefore, as discussed above and depending on the circumstances, the appropriate reviewing authority may be the Regional Office, Federal Land Manager(s), State agency(ies), or perhaps local agency(ies). In cases where review and approval comes solely from the Regional Office (sometimes stated as "*Regional Administrator*"), this will be stipulated. If there is any question as to the appropriate reviewing authority, you should contact the Regional modeling contact (*http://www.epa.gov/scram001/tt26.htm#regionalmodelingcontacts*) in the appropriate EPA Regional Office, whose jurisdiction generally includes the physical location of the source in question and its expected impacts.

c. In all regulatory analyses, especially if other than preferred models are selected for use, early discussions among Regional Office staff, State and local control agencies, industry representatives, and where appropriate, the Federal Land Manager, are invaluable and are encouraged. Agreement on the data base(s) to be used, modeling techniques to be applied and the overall technical approach, prior to the actual analyses, helps avoid misunderstandings concerning the final results and may reduce the later need for additional analyses. The use of an air quality analysis checklist, such as is posted on EPA's Internet SCRAM Web site (subsection 2.3), and the preparation of a written protocol help to keep misunderstandings at a minimum.

d. It should not be construed that the preferred models identified here are to be permanently used to the exclusion of all others or that they are the only models available for relating emissions to air quality. The model that most accurately estimates concentrations in the area of interest is always sought. However, designation of specific models is needed to promote consistency in model selection and application.

e. The 1980 solicitation of new or different models from the technical community and the program whereby these models were evaluated, established a means by which new models are identified, reviewed and made available in the *Guideline*. There is a pressing need for the development of models for a wide range of regulatory applications. Refined models that more realistically simulate the physical and chemical process in the atmosphere and that more reliably estimate pollutant concentrations are needed. Thus, the solicitation of models is considered to be continuous.

3.1 *Preferred Modeling Techniques*

3.1.1 Discussion

a. EPA has developed models suitable for regulatory application. Other models have been submitted by private developers for possible inclusion in the *Guideline*. These refined models have undergone evaluation exercises [7,8,9,10,11,12,13,14,15] that include statistical measures of model performance in comparison with measured air quality data as suggested by the American Meteorological Society [16] and, where possible, peer scientific reviews. [17,18,19,20,21]

b. When a single model is found to perform better than others, it is recommended for application as a preferred model and listed in Appendix A. If no one model is found to clearly perform better through the evaluation exercise, then the preferred model listed in Appendix A is selected on the basis of other factors such as past use, public familiarity, cost or resource requirements, and availability. No further evaluation of a preferred model is required for a particular application if the EPA recommendations for regulatory use specified for the model in the *Guideline* are followed. Alternative models to those listed in Appendix A should generally be compared with measured air quality data when they are used for regulatory applications consistent with recommendations in subsection 3.2.

c. The solicitation of new refined models which are based on sounder scientific principles and which more reliably estimate pollutant concentrations is considered by EPA to be continuous. Models that are submitted in accordance with the established provisions will be evaluated as submitted. These requirements are:

i. The model must be computerized and functioning in a common computer code suitable for use on a variety of computer systems.

ii. The model must be documented in a user's guide which identifies the mathematics of the model, data requirements and program operating characteristics at a level of detail comparable to that available for currently recommended models.

iii. The model must be accompanied by a complete test data set including input parameters and output results. The test data must be included in the user's guide as well as provided in computer-readable form.

iv. The model must be useful to typical users, *e.g.*, State air pollution control agencies, for specific air quality control problems. Such users should be able to operate the computer program(s) from available documentation.

v. The model documentation must include a comparison with air quality data (and/or tracer measurements) or with other well-established analytical techniques.

vi. The developer must be willing to make the model available to users at reasonable cost or make it available for public access through the Internet or National Technical Information Service: the model cannot be proprietary.

d. The evaluation process will include a determination of technical merit, in accordance with the above six items including the practicality of the model for use in ongoing regulatory programs. Each model will also be subjected to a performance evaluation for an appropriate data base and to a peer scientific review. Models for wide use (not just an isolated case) that are found to perform better will be proposed for inclusion as preferred models in future *Guideline* revisions.

3.1.2 Recommendations

a. Appendix A identifies refined models that are preferred for use in regulatory applications. If a model is required for a particular application, the user should select a model from that appendix. These models may be used without a formal demonstration of applicability as long as they are used as indicated in each model summary of Appendix A. Further recommendations for the application of these models to specific source problems are found in subsequent sections of the *Guideline*.

b. If changes are made to a preferred model without affecting the concentration estimates, the preferred status of the model is unchanged. Examples of modifications that do not affect concentrations are those made to enable use of a different computer or those that affect only the format or averaging time of the model results. However, when any changes are made, the Regional Administrator should require a test case example to demonstrate that the concentration estimates are not affected.

c. A preferred model should be operated with the options listed in Appendix A as "Recommendations for Regulatory Use." If other options are exercised, the model is no longer "preferred." Any other modification to a preferred model that would result in a change in the concentration estimates likewise alters its status as a preferred model. Use of the model must then be justified on a case-by-case basis.

3.2 *Use of Alternative Models*

3.2.1 Discussion

a. Selection of the best techniques for each individual air quality analysis is always encouraged, but the selection should be done in a consistent manner. A simple listing of models in this guide cannot alone achieve that consistency nor can it necessarily provide the best model for all possible situations. EPA reports [22,23] are available to assist in developing a consistent approach when justifying the use of other than the preferred modeling techniques recommended in the *Guideline*. An ASTM reference[24] provides a general philosophy for developing and implementing advanced statistical evaluations of atmospheric dispersion models, and provides an example statistical technique to illustrate the application of this philosophy. An EPA reference[25] provides a statistical technique for evaluating model performance for predicting peak concentration values, as might be observed at individual monitoring locations. In many cases, this protocol should be considered preferentially to the material in Chapter 3 of reference 22. The procedures in these documents provide a general framework for objective decision-making on the acceptability of an alternative model for a given regulatory application. The documents contain procedures for conducting both the technical evaluation of the model and the field test or performance evaluation.

b. This section discusses the use of alternate modeling techniques and defines three situations when alternative models may be used.

3.2.2 Recommendations

a. Determination of acceptability of a model is a Regional Office responsibility. Where the Regional Administrator finds that an alternative model is more appropriate than a preferred model, that model may be used subject to the recommendations of this subsection. This finding will normally result from a determination that (1) a preferred air quality model is not appropriate for the particular application; or (2) a more appropriate model or analytical procedure is available and applicable.

b. An alternative model should be evaluated from both a theoretical and a performance perspective before it is selected for use. There are three separate conditions under which such a model may normally be approved for use: (1) If a demonstration can be made that the model produces concentration estimates equivalent to the estimates obtained using a preferred model; (2) if a statistical performance evaluation has been conducted using measured air quality data and the results of that evaluation indicate the alternative model performs better for the given application than a comparable model in Appendix A; or (3) if the preferred model is less appropriate for the specific application, or there is no preferred model. Any one of these three separate conditions may make use of an alternative model acceptable. Some known alternative models that are applicable for selected situations are listed on EPA's SCRAM Internet Web site (subsection 2.3). However, inclusion there does not confer any unique status relative to other alternative models that are being or will be developed in the future.

c. Equivalency, condition (1) in paragraph (b) of this subsection, is established by demonstrating that the maximum or highest, second highest concentrations are within 2 percent of the estimates obtained from the preferred model. The option to show equivalency is intended as a simple demonstration of acceptability for an alternative model that is so nearly identical (or contains options that can make it identical) to a preferred model that it can be treated for practical purposes as the preferred model. Two percent was selected as the basis for equivalency since it is a rough approximation of the fraction that PSD Class I increments are of the NAAQS for SO^2, *i.e.*, the difference in concentrations that is judged to be significant. However, notwithstanding this demonstration, models that are not equivalent may be used when one of the two other conditions described in paragraphs (d) and (e) of this subsection are satisfied.

d. For condition (2) in paragraph (b) of this subsection, the procedures and techniques for determining the acceptability of a model for an individual case based on superior performance are contained in references 22–25 should be followed, as appropriate. Preparation and implementation of an evaluation protocol which is acceptable to both control agencies and regulated industry is an important element in such an evaluation.

e. Finally, for condition (3) in paragraph (b) of this subsection, an alternative refined model may be used provided that:

i. The model has received a scientific peer review;

ii. The model can be demonstrated to be applicable to the problem on a theoretical basis;

iii. The data bases which are necessary to perform the analysis are available and adequate;

iv. Appropriate performance evaluations of the model have shown that the model is not biased toward underestimates; and

v. A protocol on methods and procedures to be followed has been established.

3.3 Availability of Supplementary Modeling Guidance

a. The Regional Administrator has the authority to select models that are appropriate for use in a given situation. However, there is a need for assistance and guidance in the selection process so that fairness and consistency in modeling decisions is fostered among the various Regional Offices and the States. To satisfy that need, EPA established the Model Clearinghouse[5] and also holds periodic workshops with headquarters, Regional Office, State, and local agency modeling representatives.

b. The Regional Office should always be consulted for information and guidance concerning modeling methods and interpretations of modeling guidance, and to ensure that the air quality model user has available the latest most up-to-date policy and procedures. As appropriate, the Regional Office may request assistance from the Model Clearinghouse after an initial evaluation and decision has been reached concerning the application of a model, analytical technique or data base in a particular regulatory action.

4.0 Simple-Terrain Stationary Source Models

4.1 Discussion

a. Simple terrain, as used here, is considered to be an area where terrain features are all lower in elevation than the top of the stack of the source(s) in question. The models recommended in this section are generally used in the air quality impact analysis of stationary sources for most criteria pollutants. The averaging time of the concentration estimates produced by these models ranges from 1 hour to an annual average.

b. In the early 1980s, model evaluation exercises were conducted to determine the "best, most appropriate point source model" for use in simple terrain.[8,17] No one model was found to be clearly superior and, based on past use, public familiarity, and availability, ISC (predecessor to ISC3[26]) became the recommended model for a wide range of regulatory applications. Other refined models which also employed the basic Gaussian kernel, *i.e.*, BLP, CALINE3, OCD, and EDMS, were developed for specialized applications (Appendix A). Performance evaluations were also made for these models, which are identified in Appendix A.

4.2 Recommendations

4.2.1 Screening Techniques

a. Where a preliminary or conservative estimate is desired, point source screening techniques are an acceptable approach to air quality analyses. EPA has published guidance for screening procedures,[27] and a computerized version of the recommended screening technique, SCREEN3, is available.[28]

b. All screening procedures should be adjusted to the site and problem at hand. Close attention should be paid to whether the area should be classified urban or rural in accordance with subsection 8.2.3. The climatology of the area should be studied to help define the worst-case meteorological conditions. Agreement should be reached between the model user and the appropriate reviewing authority (paragraph 3.0(b)) on the choice of the screening model for each analysis, and on the input data as well as the ultimate use of the results.

4.2.2 Refined Analytical Techniques

a. A brief description of preferred models for refined applications is found in Appendix A. Also listed in that appendix are the model input requirements, the standard options that should be selected when running the program, and output options.

b. When modeling for compliance with short term NAAQS and PSD increments is of primary concern, a short term model may be used to provide long term concentration estimates. The conversion from long term to short term concentration averages by any transformation technique is not acceptable in regulatory applications.

c. The state-of-the-science for modeling atmospheric deposition is evolving and the best techniques are currently being assessed and their results are being compared with observations. Consequently, the approach taken for any purpose should be coordinated with the appropriate reviewing authority (paragraph 3.0(b)).

5.0 Model Use in Complex Terrain

5.1 Discussion

a. For the purpose of the *Guideline*, complex terrain is defined as terrain exceeding the height of the stack being modeled. Complex terrain dispersion models are normally applied to stationary sources of pollutants such as SO_2 and particulates.

b. A major outcome from the EPA Complex Terrain Model Development project has been the publication of a refined dispersion model (CTDM) suitable for regulatory application to plume impaction assessments in complex terrain.[29] Although CTDM as originally produced was only applicable to those hours characterized as neutral or stable, a computer code for all stability conditions—CTDMPLUS—together with a user's guide,[30] and site specific meteorological and terrain data processors [31,32] is available. Moreover, CTSCREEN,[33] a version of CTDMPLUS that does not require site specific meteorological data inputs, is also available as a screening technique.

c. The methods discussed in this section should be considered in two categories: (1) Screening techniques, and (2) the refined dispersion model, CTDMPLUS, discussed in this subsection and listed in Appendix A.

d. Continued improvements in ability to accurately model plume dispersion in complex terrain situations can be expected, *e.g.*, from research on lee side effects due to terrain obstacles. New approaches to improve the ability of models to realistically simulate atmospheric physics, *e.g.*, hybrid models which incorporate an accurate wind field analysis, will ultimately provide more appropriate tools for analyses. Such hybrid modeling techniques are also acceptable for regulatory applications after the appropriate demonstration and evaluation.[22]

5.2 Recommendations

a. Recommendations in this section apply primarily to those situations where the impaction of plumes on terrain at elevations equal to or greater than the plume centerline during stable atmospheric conditions are determined to be the problem. If a violation of any NAAQS or the controlling increment is indicated by using any of the preferred screening techniques, then a refined complex terrain model may be used. Phenomena such as fumigation, wind direction shear, lee-side effects, building wake- or terrain-induced downwash, deposition, chemical transformation, variable plume trajectories, and long range transport are not addressed by the recommendations in this section.

b. Where site specific data are used for either screening or refined complex terrain models, a data base of at least 1 full-year of meteorological data is preferred. If more data are available, they should be used. Meteorological data used in the analysis should be reviewed for both spatial and temporal representativeness.

c. Placement of receptors requires very careful attention when modeling in complex terrain. Often the highest concentrations are predicted to occur under very stable conditions, when the plume is near, or impinges on, the terrain. The plume under such conditions may be quite narrow in the vertical, so that even relatively small changes in a receptor's location may substantially affect the predicted concentration. Receptors within about a kilometer of the source may be even more sensitive to location. Thus, a dense array of receptors may be required in some cases. In order to avoid excessively large computer runs due to such a large array of receptors, it is often desirable to model the area twice. The first model run would use a moderate number of receptors carefully located over the area of interest. The second model run would use a more dense array of receptors in areas showing potential for high concentrations, as indicated by the results of the first model run.

d. When CTSCREEN or CTDMPLUS is used, digitized contour data must be first processed by the CTDM Terrain Processor [32] to provide hill shape parameters in a format suitable for direct input to CTDMPLUS. Then the user supplies receptors either through an interactive program that is part of the model or directly, by using a text editor; using both methods to select receptors will generally be necessary to assure that the maximum concentrations are estimated by either model. In cases where a terrain feature may "appear to the plume" as smaller, multiple hills, it may be necessary to model the terrain both as a single feature and as multiple hills to determine design concentrations.

e. The user is encouraged to confer with the Regional Office if any unresolvable problems are encountered with any screening or refined analytical procedures, *e.g.*, meteorological data, receptor siting, or terrain contour processing issues.

5.2.1 Screening Techniques

a. CTSCREEN [33] can be used to obtain conservative, yet realistic, worst-case estimates for receptors located on terrain above stack height. CTSCREEN accounts for the three-dimensional nature of plume and terrain interaction and requires detailed terrain data representative of the modeling domain. The model description and user's instructions are contained in the user's guide.[33] The terrain data must be digitized in the same manner as for CTDMPLUS and a terrain processor is available.[32] A discussion of the model's performance characteristics is provided in a technical paper.[34] CTSCREEN is designed to execute a fixed matrix of meteorological values for wind speed (u), standard deviation of horizontal and vertical wind speeds (σ_v, σ_w), vertical potential temperature gradient ($d\theta/dz$), friction velocity (u_*), Monin-Obukhov length (L), mixing height (z_i) as a function of terrain height, and wind directions for both neutral/stable conditions and unstable convective conditions. Table 5–1 contains the matrix of meteorological variables that is used for each CTSCREEN analysis. There are 96 combinations, including exceptions, for each wind direction for the neutral/stable case, and 108 combinations for the unstable case. The specification of wind direction, however, is handled internally, based on the source and terrain geometry. Although CTSCREEN is designed to address a single source scenario, there are a number of options that can be selected on a case-by-case basis to address multi-source situations. However, the appropriate reviewing authority (paragraph 3.0(b)) should be consulted, and concurrence obtained, on the protocol for modeling multiple sources with CTSCREEN to ensure that the worst case is identified and assessed. The maximum concentration output from CTSCREEN represents a worst-case 1-hour concentration. Time-scaling factors of 0.7 for 3-hour, 0.15 for 24-hour and 0.03 for annual concentration averages are applied internally by CTSCREEN to the highest 1-hour concentration calculated by the model.

b. Placement of receptors requires very careful attention when modeling in complex terrain. Often the highest concentrations are predicted to occur under very stable conditions, when the plume is near, or impinges on, the terrain. The plume under such conditions may be quite narrow in the vertical, so that even relatively small changes in a receptor's location may substantially affect the predicted concentration. Receptors within about a kilometer of the source may be even more sensitive to location. Thus, a dense array of receptors may be required in some cases. In order to avoid excessively large computer runs due to such a large array of receptors, it is often desirable to model the area twice. The first model run would use a moderate number of receptors carefully located over the area of interest. The second model run would use a more dense array of receptors in areas showing potential for high concentrations, as indicated by the results of the first model run.

c. As mentioned above, digitized contour data must be preprocessed [32] to provide hill shape parameters in suitable input format. The user then supplies receptors either through an interactive program that is part of the model or directly, by using a text editor; using both methods to select receptors will generally be necessary to assure that the maximum concentrations are estimated by either model. In cases where a terrain feature may "appear to the plume" as smaller, multiple hills, it may be necessary to model the terrain both as a single feature and as multiple hills to determine design concentrations.

d. Other screening techniques, *e.g.*, Valley (as implemented in SCREEN3 [25]), COMPLEX I (as implemented in ISC3 [26]), SHORTZ/LONGZ [35], and RTDM [36] may be acceptable for complex terrain cases where established procedures are used. The user is encouraged to confer with the appropriate reviewing authority (paragraph 3.0(b)) if any unresolvable problems are encountered, *e.g.*, applicability, meteorological data, receptor siting, or terrain contour processing issues.

5.2.2 Refined Analytical Techniques

a. When the results of the screening analysis demonstrate a possible violation of NAAQS or the controlling PSD increments, a more refined analysis may need to be conducted.

b. The Complex Terrain Dispersion Model PLus Algorithms for Unstable Situations (CTDMPLUS) is a refined air quality model that is preferred for use in all stability conditions for complex terrain applications. CTDMPLUS is a sequential model that requires five input files: (1) General program specifications; (2) a terrain data file; (3) a receptor file; (4) a surface meteorological data file; and (5) a user created meteorological profile data file. Two optional input files consist of hourly emissions parameters and a file containing upper air data from rawinsonde data files, *e.g.*, a National Climatic Data Center TD–6201 file, unless there are no hours categorized as unstable in the record. The model description and user instructions are contained in Volume 1 of the User's Guide.[30] Separate publications [32,31] describe the terrain preprocessor system and the meteorological preprocessor program. In *Part I* of a technical article [37] is a discussion of the model and its preprocessors; the model's performance characteristics are discussed in *Part II* of the same article.[38] The size of the CTDMPLUS executable file on a personal computer is approximately 360K bytes. The model produces hourly average concentrations of stable pollutants, *i.e.*, chemical transformation or decay of species and settling/deposition are not simulated. To obtain concentration averages corresponding to the NAAQS, *e.g.*, 3- or 24-hour, or annual averages, the user must execute a postprocessor program such as CHAVG. CTDMPLUS is applicable to all receptors on terrain elevations above stack top. However, the model contains no algorithms for simulating building downwash or the mixing or recirculation found in cavity zones in the lee of a hill. The path taken by a plume through an array of hills cannot be simulated. CTDMPLUS does not explicitly simulate calm meteorological periods, and for those situations the user should follow the guidance in subsection 9.3.4. The user should follow the recommendations in the User's Guide under General Program Specifications for: (1) Selecting mixed layer heights, (2) setting minimum scalar wind speed to 1 m/s, and (3) scaling wind direction with height. Close coordination with the Regional Office is essential to insure a consistent, technically sound application of this model.

c. The performance of CTDMPLUS is greatly improved by the use of meteorological data from several levels up to plume height. However, due to the vast range of source-plume-hill geometries possible in complex terrain, detailed requirements for meteorological monitoring in support of refined analyses using CTDMPLUS should be determined on a case-by-case basis. The following general guidance should be considered in the development of a meteorological monitoring protocol for regulatory applications of CTDMPLUS and reviewed in detail by the Regional Office before initiating any monitoring. As appropriate, EPA guidance (see reference 100) should be consulted for specific guidance on siting requirements for meteorological towers, selection and exposure of sensors, etc. As more experience is gained with the model in a variety of circumstances, more specific guidance may be developed.

d. Site specific meteorological data are critical to dispersion modeling in complex terrain and, consequently, the meteorological requirements are more demanding than for simple terrain. Generally, three different meteorological files (referred to as surface, profile, and rawin files) are needed to run CTDMPLUS in a regulatory mode.

e. The surface file is created by the meteorological preprocessor (METPRO) [31] based on site specific measurements or estimates of solar and/or net radiation, cloud cover and ceiling, and the mixed layer height. These data are used in METPRO to calculate the various surface layer scaling parameters (roughness length, friction velocity, and Monin-Obukhov length) which are needed to run the model. All of the user inputs required for the surface file are based either on surface observations or on measurements at or below 10m.

f. The profile data file is prepared by the user with site specific measurements (from at least three levels) of wind speed, wind direction, turbulence, and potential temperature. These measurements should be obtained up to the representative plume height(s) of interest (*i.e.*, the plume height(s) under those conditions important to the determination of the design concentration). The representative plume height(s) of interest should be determined using an appropriate complex terrain screening procedure (*e.g.*, CTSCREEN) and should be documented in the monitoring/modeling protocol. The necessary meteorological measurements should be obtained from an appropriately sited meteorological tower augmented by SODAR if the representative plume height(s) of interest exceed 100m. The meteorological tower need not exceed the lesser of the representative plume height of interest (the highest plume height if there is more than one plume height of interest) or 100m.

g. Locating towers on nearby terrain to obtain stack height or plume height measurements for use in profiles by CTDMPLUS should be avoided unless it can clearly be demonstrated that such measurements would be representative of conditions affecting the plume.

h. The rawin file is created by a second meteorological preprocessor (READ62) [31] based on NWS (National Weather Service) upper air data. The rawin file is used in CTDMPLUS to calculate vertical potential temperature gradients for use in estimating plume penetration in unstable conditions. The representativeness of the off-site NWS upper air data should be evaluated on a case-by-case basis.

i. In the absence of an appropriate refined model, screening results may need to be used to determine air quality impact and/or emission limits.

TABLE 5–1A.—NEUTRAL/STABLE METEOROLOGICAL MATRIX FOR CTSCREEN

Variable	Specific values				
U (m/s)	1.0	2.0	3.0	4.0	5.0
σ_v (m/s)	0.3	0.75	....	....	....
σ_w (m/s)	0.08	0.15	0.30	0.75	....
$\Delta\theta/\Delta z$ (K/m)	0.01	0.02	0.035	....	....
WD	(Wind direction optimized internally for each meteorological combination)				

Exceptions:
(1) If $U \le 2$ m/s and $\sigma_v \le 0.3$ m/s, then include $\sigma_w = 0.04$ m/s.
(2) If $\sigma_w = 0.75$ m/s and $U > 3.0$ m/s, then $\Delta\theta/\Delta z$ is limited to ≤ 0.01 K/m.
(3) If $U \ge 4$ m/s, then $\sigma w \ge 0.15$ m/s.
(4) $\sigma_w \le \sigma_v$

TABLE 5–1B.—UNSTABLE/CONVECTIVE METEOROLOGICAL MATRIX FOR CTSCREEN

Variable	Specific values				
U (m/s)	1.0	2.0	3.0	4.0	5.0
u_* (m/s)	0.1	0.3	0.5	....	....
L (m)	−10	−50	−90	....	....
$\Delta\sigma/\Delta z$ (K/m)	0.030 (potential temperature gradient above z_i)				
z_i (m)	0.5h	1.0h	1.5h	....	....
	(where h = terrain height)				

6.0 Models for Ozone, Particulate Matter, Carbon Monoxide, Nitrogen Dioxide, and Lead

6.1 Discussion

a. This section identifies modeling approaches or models appropriate for addressing ozone (O_3)[1], carbon monoxide (CO), nitrogen dioxide (NO_2), particulates (PM–2.5[a] and PM–10), and lead. These pollutants are often associated with emissions from numerous sources. Generally, mobile sources contribute significantly to emissions of these pollutants or their precursors. For cases where it is of interest to estimate concentrations of CO or NO_2 near a single or small group of stationary sources, refer to Section 4. (Modeling approaches for SO_2 are discussed in Section 4.)

b. Several of the pollutants mentioned in the preceding paragraph are closely related to each other in that they share common sources of emissions and/or are subject to chemical transformations of similar precursors.[39, 40] For example, strategies designed to reduce ozone could have an effect on the secondary component of PM–2.5 and vice versa. Thus, it makes sense to use models which take into account the chemical coupling between O_3 and PM–2.5, when feasible. This should promote consistency among methods used to evaluate strategies for reducing different pollutants as well as consistency among the strategies themselves. Regulatory requirements for the different pollutants are likely to be due at different times. Thus, the following paragraphs identify appropriate modeling approaches for pollutants individually.

c. The NAAQS for ozone was revised on July 18, 1997 and is now based on an 8-hour averaging period. Models for ozone are needed primarily to guide choice of strategies to correct an observed ozone problem in an area not attaining the NAAQS for ozone. Use of photochemical grid models is the recommended means for identifying strategies needed to correct high ozone concentrations in such areas. Such models need to consider emissions of volatile organic compounds (VOC), nitrogen oxides (NO_X) and carbon monoxide (CO), as well as means for generating meteorological data governing transport and dispersion of ozone and its precursors. Other approaches, such as Lagrangian or observational models may be used to guide choice of appropriate strategies to consider with a photochemical grid model. These other approaches may be sufficient to address ozone in an area where observed concentrations are near the NAAQS or only slightly above it. Such a decision needs to be made on a case-by-case basis in concert with the Regional Office.

d. A control agency with jurisdiction over one or more areas with significant ozone problems should review available ambient air quality data to assess whether the problem is likely to be significantly impacted by regional transport.[41] Choice of a modeling approach depends on the outcome of this review. In cases where transport is considered significant, use of a nested regional model may be the preferred approach. If the observed problem is believed to be primarily of local origin, use of a model with a single horizontal grid resolution and geographical coverage that is less than that of a regional model may suffice.

e. The fine particulate matter NAAQS, promulgated on July 18, 1997, includes particles with an aerodynamic diameter nominally less than or equal to 2.5 micrometers (PM–2.5). Models for PM–2.5 are needed to assess adequacy of a proposed strategy for meeting annual and/or 24-hour NAAQS for PM–2.5. PM–2.5 is a mixture consisting of several diverse components. Because chemical/physical properties and origins of each component differ, it may be appropriate to use either a single model capable of addressing several of the important components or to model primary and secondary components using different models. Effects of a control strategy on PM–2.5 is estimated from the sum of the effects on the components composing PM–2.5. Model users may refer to guidance[42] for further details concerning appropriate modeling approaches.

f. A control agency with jurisdiction over one or more areas with PM–2.5 problems should review available ambient air quality data to assess which components of PM–2.5 are likely to be major contributors to the problem. If it is determined that regional transport of secondary particulates, such as sulfates or nitrates, is likely to contribute significantly to the problem, use of a regional model may be the preferred approach. Otherwise, coverage may be limited to a domain that is urban scale or less. Special care should be taken to select appropriate geographical coverage for a modeling application.[42]

g. The NAAQS for PM–10 was promulgated in July 1987. A SIP development guide[43] is available to assist in PM–10 analyses and control strategy development. EPA promulgated regulations for PSD increments measured as PM–10 in a notice published on June 3, 1993. As an aid to assessing the impact on ambient air quality of particulate matter generated from prescribed burning activities, a reference[44] is available.

h. Models for assessing the impacts of particulate matter may involve dispersion models or receptor models, or a combination (depending on the circumstances). Receptor models focus on the behavior of the ambient environment at the point of impact as opposed to source-oriented dispersion models, which focus on the transport, diffusion, and transformation that begin at the source and continue to the receptor site. Receptor models attempt to identify and apportion sources by relating known sample compositions at receptors to measured or inferred compositions of source emissions. When complete and accurate emission inventories or meteorological characterization are unavailable, or unknown pollutant sources exist, receptor modeling may be necessary.

i. Models for assessing the impact of CO emissions are needed for a number of different purposes. Examples include evaluating effects of point sources, congested intersections and highways, as well as the cumulative effect of numerous sources of CO in an urban area.

j. Models for assessing the impact of sources on ambient NO_2 concentrations are primarily needed to meet new source review requirements, such as addressing the effect of a proposed source on PSD increments for annual concentrations of NO_2. Impact of an individual source on ambient NO_2 depends, in part, on the chemical environment into which the source's plume is to be emitted. There are several approaches for estimating effects of an individual source on ambient NO_2. One approach is through use of a plume-in-grid algorithm imbedded within a photochemical grid model. However, because of the rigor and complexity involved, and because this approach may not be capable of defining sub-grid concentration gradients, the plume-in-grid approach may be impractical for estimating effects on an annual PSD increment. A second approach is to develop site specific conversion factors based on measurements. If it is not possible to develop site specific conversion factors and use of the plume-in-grid algorithm is also not feasible, other screening procedures may be considered.

k. In January 1999 (40 CFR part 58, Appendix D), EPA gave notice that concern about ambient lead impacts was being shifted away from roadways and toward a focus on stationary point sources. EPA has also issued guidance on siting ambient monitors in the vicinity of such sources.[45] For lead, the SIP should contain an air quality analysis to determine the maximum quarterly lead concentration resulting from major lead point sources, such as smelters, gasoline additive plants, etc. General guidance for lead SIP development is also available.[46]

6.2 Recommendations

6.2.1 Models for Ozone

a. *Choice of Models for Multi-source Applications.* Simulation of ozone formation and transport is a highly complex and resource intensive exercise. Control agencies with jurisdiction over areas with ozone problems are encouraged to use photochemical grid models, such as the Models-3/Community Multi-scale Air Quality (CMAQ) modeling system[47], to evaluate the relationship between precursor species and ozone. Judgement on the suitability of a model for a given application should consider factors that include use of the model in an attainment test, development of emissions and meteorological inputs to the model and choice of episodes to model.[41] Similar models for the 8-hour NAAQS and for the 1-hour NAAQS are appropriate.

b. *Choice of Models to Complement Photochemical Grid Models.* As previously noted, observational models, Lagrangian models, or the Empirical Kinetics Modeling Approach (EKMA)[48, 49] may be used to help guide choice of strategies to simulate with a photochemical grid model and to corroborate results obtained with a grid model. Receptor models have also been used

[1] Modeling for attainment demonstrations for O_3 and PM–2.5 should be conducted in time to meet required SIP submission dates as provided for in the respective implementation rules. Information on implementation of the 8-hr O_3 and PM–2.5 standards is available at: *http://www.epa.gov/ttn/naaqs/.*

to apportion sources of ozone precursors (*e.g.*, VOC) in urban domains. EPA has issued guidance[41] in selecting appropriate techniques.

c. *Estimating the Impact of Individual Sources.* Choice of methods used to assess the impact of an individual source depends on the nature of the source and its emissions. Thus, model users should consult with the Regional Office to determine the most suitable approach on a case-by-case basis (subsection 3.2.2).

6.2.2 Models for Particulate Matter

6.2.2.1 PM–2.5

a. *Choice of Models for Multi-source Applications.* Simulation of phenomena resulting in high ambient PM–2.5 can be a multi-faceted and complex problem resulting from PM–2.5's existence as an aerosol mixture. Treating secondary components of PM–2.5, such as sulfates and nitrates, can be a highly complex and resource-intensive exercise. Control agencies with jurisdiction over areas with secondary PM–2.5 problems are encouraged to use models which integrate chemical and physical processes important in the formation, decay and transport of these species (*e.g.*, Models-3/CMAQ[47] or REMSAD[50]). Primary components can be simulated using less resource-intensive techniques. Suitability of a modeling approach or mix of modeling approaches for a given application requires technical judgement[42], as well as professional experience in choice of models, use of the model(s) in an attainment test, development of emissions and meteorological inputs to the model and selection of days to model.

b. *Choice of Analysis Techniques to Complement Air Quality Simulation Models.* Receptor models may be used to corroborate predictions obtained with one or more air quality simulation models. They may also be potentially useful in helping to define specific source categories contributing to major components of PM–2.5.[42]

c. *Estimating the Impact of Individual Sources.* Choice of methods used to assess the impact of an individual source depends on the nature of the source and its emissions. Thus, model users should consult with the Regional Office to determine the most suitable approach on a case-by-case basis (subsection 3.2.2).

6.2.2.2 PM–10

a. Screening techniques like those identified in subsection 4.2.1 are applicable to PM–10. Conservative assumptions which do not allow removal or transformation are suggested for screening. Thus, it is recommended that subjectively determined values for "half-life" or pollutant decay not be used as a surrogate for particle removal. Proportional models (rollback/forward) may not be applied for screening analysis, unless such techniques are used in conjunction with receptor modeling.[43]

b. Refined models such as those discussed in subsection 4.2.2 are recommended for PM–10. However, where possible, particle size, gas-to-particle formation, and their effect on ambient concentrations may be considered. For point sources of small particles and for source-specific analyses of complicated sources, use the appropriate recommended steady-state plume dispersion model (subsection 4.2.2). For guidance on determination of design concentrations, see paragraph 8.2.1.1(o).

c. Receptor models have proven useful for helping validate emission inventories and for corroborating source-specific impacts estimated by dispersion models. The Chemical Mass Balance (CMB) model is useful for apportioning impacts from localized sources.[51,52,53] Other receptor models, *e.g.*, the Positive Matrix Factorization (PMF) model[54] and Unmix[55], which don't share some of CMB's constraints, have also been applied. In regulatory applications, dispersion models have been used in conjunction with receptor models to attribute source (or source category) contributions. Guidance is available for PM–10 sampling and analysis applicable to receptor modeling.[56]

d. Under certain conditions, recommended dispersion models may not be reliable. In such circumstances, the modeling approach should be approved by the Regional Office on a case-by-case basis. Analyses involving model calculations for stagnation conditions should also be justified on a case-by-case basis (subsection 8.2.8).

e. Fugitive dust usually refers to dust put into the atmosphere by the wind blowing over plowed fields, dirt roads or desert or sandy areas with little or no vegetation. Reentrained dust is that which is put into the air by reason of vehicles driving over dirt roads (or dirty roads) and dusty areas. Such sources can be characterized as line, area or volume sources. Emission rates may be based on site specific data or values from the general literature. Fugitive emissions include the emissions resulting from the industrial process that are not captured and vented through a stack but may be released from various locations within the complex. In some unique cases a model developed specifically for the situation may be needed. Due to the difficult nature of characterizing and modeling fugitive dust and fugitive emissions, it is recommended that the proposed procedure be cleared by the Regional Office for each specific situation before the modeling exercise is begun.

6.2.3 Models for Carbon Monoxide

a. Guidance is available for analyzing CO impacts at roadway intersections.[57] The recommended screening model for such analyses is CAL3QHC.[58,59] This model combines CALINE3 (listed in Appendix A) with a traffic model to calculate delays and queues that occur at signalized intersections. The screening approach is described in reference 57; a refined approach may be considered on a case-by-case basis with CAL3QHCR.[60] The latest version of the MOBILE (mobile source emission factor) model should be used for emissions input to intersection models.

b. For analyses of highways characterized by uninterrupted traffic flows, CALINE3 is recommended, with emissions input from the latest version of the MOBILE model.

c. For urban area wide analyses of CO, an Eulerian grid model should be used. Information on SIP development and requirements for using such models can be found in several references.[57,61,62,63]

d. Where point sources of CO are of concern, they should be treated using the screening and refined techniques described in Section 4.

6.2.4 Models for Nitrogen Dioxide (Annual Average)

a. A tiered screening approach is recommended to obtain annual average estimates of NO_2 from point sources for New Source Review analysis, including PSD, and for SIP planning purposes. This multi-tiered approach is conceptually shown in Figure 6–1 and described in paragraphs b through d of this subsection:

FIGURE 6-1

Multi-tiered Screening Approach for Estimating Annual NO_2 Concentrations from Point Sources

Tier 1:	Assume Total Conversion of NO to NO_2
	↓
Tier 2:	Multiply Annual NO_x Estimate by Representative Equilibrium NO_2 / NO_x Ratio (e.g., 0.75 National Default Ratio)
	↓
Tier 3:	Detailed Analysis on Case-by-Case Basis

b. For Tier 1 (the initial screen), use an appropriate model in subsection 4.2.2 to estimate the maximum annual average concentration and assume a total conversion of NO to NO_2. If the concentration exceeds the NAAQS and/or PSD increments for NO_2, proceed to the 2nd level screen.

c. For Tier 2 (2nd level) screening analysis, multiply the Tier 1 estimate(s) by an empirically derived NO_2/NO_X value of 0.75 (annual national default).[64] The reviewing agency may establish an alternative default NO_2/NO_X ratio based on ambient annual average NO_2 and annual average NO_X data representative of area wide quasi-equilibrium conditions. Alternative default NO_2/NO_X ratios should be based on data satisfying quality assurance procedures that ensure data accuracy for both NO_2 and NO_X within the typical range of measured values. In areas with relatively low NO_X concentrations, the quality assurance procedures used to determine compliance with the NO_2 national ambient air quality standard may not be adequate. In addition, default NO_2/NO_X ratios, including the 0.75 national default value, can underestimate long range NO_2 impacts and should be used with caution in long range transport scenarios.

d. For Tier 3 (3rd level) analysis, a detailed screening method may be selected on a case-by-case basis. For point source modeling, other refined screening methods, such as the ozone limiting method,[65] may also be considered. Also, a site specific NO_2/NO_X ratio may be used as a detailed screening method if it meets the same restrictions as described for alternative default NO_2/NO_X ratios. Ambient NO_X monitors used to develop a site specific ratio should be sited to obtain the NO_2 and NO_X concentrations under quasi-equilibrium conditions. Data obtained from monitors sited at the maximum NO_X impact site, as may be required in a PSD pre-construction monitoring program, likely reflect transitional NO_X conditions. Therefore, NO_X data from maximum impact sites may not be suitable for determining a site specific NO_2/ NO_X ratio that is applicable for the entire modeling analysis. A site specific ratio derived from maximum impact data can only be used to estimate NO_2 impacts at receptors located within the same distance of the source as the source-to-monitor distance.

e. In urban areas (subsection 6.2.3), a proportional model may be used as a preliminary assessment to evaluate control strategies to meet the NAAQS for multiple minor sources, *i.e.*, minor point, area and mobile sources of NO_X; concentrations resulting from major point sources should be estimated separately as discussed above, then added to the impact of the minor sources. An acceptable screening technique for urban complexes is to assume that all NO_X is emitted in the form of NO_2 and to use a model from Appendix A for nonreactive pollutants to estimate NO_2 concentrations. A more accurate estimate can be obtained by: (1) Calculating the annual average concentrations of NO_X with an urban model, and (2) converting these estimates to NO_2 concentrations using an empirically derived annual NO_2/NO_X ratio. A value of 0.75 is recommended for this ratio. However, a spatially averaged alternative default annual NO_2/NO_X ratio may be determined from an existing air quality monitoring network and used in lieu of the 0.75 value if it is determined to be representative of prevailing ratios in the urban area by the reviewing agency. To ensure use of appropriate locally derived annual average NO_2 / NO_X ratios, monitoring data under consideration should be limited to those collected at monitors meeting siting criteria defined in 40 CFR Part 58, Appendix D as representative of "neighborhood", "urban", or "regional" scales. Furthermore, the highest annual spatially averaged NO_2/NO_X ratio from the most recent 3 years of complete data should be used to foster conservatism in estimated impacts.

f. To demonstrate compliance with NO_2 PSD increments in urban areas, emissions from major and minor sources should be included in the modeling analysis. Point and area source emissions should be modeled as discussed above. If mobile source emissions do not contribute to localized areas of high ambient NO_2 concentrations, they should be modeled as area sources. When modeled as area sources, mobile source emissions should be assumed uniform over the entire highway link and allocated to each area source grid square based on the portion of highway link within each grid square. If localized areas of high concentrations are likely, then mobile sources should be modeled as line sources using an appropriate steady-state plume dispersion model (*e.g.*, CAL3QHCR; subsection 6.2.3).

g. More refined techniques to handle special circumstances may be considered on a case-by-case basis and agreement with the appropriate reviewing authority (paragraph 3.0(b)) should be obtained. Such techniques should consider individual quantities of NO and NO_2 emissions, atmospheric transport and dispersion, and atmospheric transformation of NO to NO_2. Where they are available, site specific data on the conversion of NO to NO_2 may be used. Photochemical dispersion models, if used for other pollutants in the area, may also be applied to the NO_X problem.

6.2.5 Models for Lead

a. For major lead point sources, such as smelters, which contribute fugitive emissions and for which deposition is important, professional judgement should be used, and there should be coordination with the appropriate reviewing authority (paragraph 3.0(b)). To model an entire major urban area or to model areas without significant sources of lead emissions, as a minimum a proportional (rollback) model may be used for air quality analysis. The rollback philosophy assumes that measured pollutant concentrations are proportional to emissions. However, urban or other dispersion models are encouraged in these circumstances where the use of such models is feasible.

b. In modeling the effect of traditional line sources (such as a specific roadway or highway) on lead air quality, dispersion models applied for other pollutants can be used. Dispersion models such as CALINE3 and CAL3QHCR have been used for modeling carbon monoxide emissions from highways and intersections (subsection 6.2.3). Where there is a point source in the middle of a substantial road network, the lead concentrations that result from the road network should be treated as background (subsection 9.2); the point source and any nearby major roadways should be modeled separately using the appropriate recommended steady-state plume dispersion model (subsection 4.2.2).

7.0 Other Model Requirements

7.1 Discussion

a. This section covers those cases where specific techniques have been developed for special regulatory programs. Most of the programs have, or will have when fully developed, separate guidance documents that cover the program and a discussion of the tools that are needed. The following paragraphs reference those guidance documents, when they are available. No attempt has been made to provide a comprehensive discussion of each topic since the reference documents were designed to do that. This section will undergo periodic revision as new programs are added and new techniques are developed.

b. Other Federal agencies have also developed specific modeling approaches for their own regulatory or other requirements.[66] Although such regulatory requirements and manuals may have come about because of EPA rules or standards, the implementation of such regulations and the use of the modeling techniques is under the jurisdiction of the agency issuing the manual or directive.

c. The need to estimate impacts at distances greater than 50km (the nominal distance to which EPA considers most steady-state Gaussian plume models are applicable) is an important one especially when considering the effects from secondary pollutants. Unfortunately, models originally available to EPA had not undergone sufficient field evaluation to be recommended for general use. Data bases from field studies at mesoscale and long range transport distances were limited in detail. This limitation was a result of the expense to perform the field studies required to verify and improve mesoscale and long range transport models. Meteorological data adequate for generating three-dimensional wind fields were particularly sparse. Application of models to complicated terrain compounds the difficulty of making good assessments of long range transport impacts. EPA completed limited evaluation of several long range transport (LRT) models against two sets of field data and evaluated results.[13] Based on the results, EPA concluded that long range and mesoscale transport models were limited for regulatory use to a case-by-case basis. However a more recent series of comparisons has been completed for a new model, CALPUFF (Section A.3). Several of these field studies involved three-to-four hour releases of tracer gas sampled along arcs of receptors at distances greater than 50km downwind. In some cases, short-term concentration sampling was available, such that the transport of the tracer puff as it passed the arc could be monitored. Differences on the order of 10 to 20 degrees were found between the location of the simulated and observed center of mass of the tracer puff. Most of the simulated centerline concentration maxima along each arc were within a factor of two of those observed. It was concluded from these case studies that the CALPUFF dispersion model had performed in a reasonable manner, and had no apparent bias toward over or under prediction, so long as the transport distance was limited to less than 300km.[67]

7.2 Recommendations

7.2.1 Visibility

a. Visibility in important natural areas (*e.g.*, Federal Class I areas) is protected under a number of provisions of the Clean Air Act, including Sections 169A and 169B (addressing impacts primarily from existing sources) and Section 165 (new source review). Visibility impairment is caused by light scattering and light absorption associated with particles and gases in the atmosphere. In most areas of the country, light scattering by PM–2.5 is the most significant component of visibility impairment. The key components of PM–2.5 contributing to visibility impairment include sulfates, nitrates, organic carbon, elemental carbon, and crustal material.

b. The visibility regulations as promulgated in December 1980 (40 CFR 51.300–307) require States to mitigate visibility impairment, in any of the 156 mandatory Federal Class I areas, that is found to be "reasonably attributable" to a single source or a small group of sources. In 1985, EPA promulgated Federal Implementation Plans (FIPs) for several States without approved visibility provisions in their SIPs. The IMPROVE (Interagency Monitoring for Protected Visual Environments) monitoring network, a cooperative effort between EPA, the States, and Federal land management agencies, was established to implement the monitoring requirements in these FIPs. Data has been collected by the IMPROVE network since 1988.

c. In 1999, EPA issued revisions to the 1980 regulations to address visibility impairment in the form of regional haze, which is caused by numerous, diverse sources (*e.g.*, stationary, mobile, and area sources) located across a broad region (40 CFR 51.308–309). The state of relevant scientific knowledge has expanded significantly since the Clean Air Act Amendments of 1977. A number of studies and reports[68,69] have concluded that long range transport (*e.g.*, up to hundreds of kilometers) of fine particulate matter plays a significant role in visibility impairment across the country. Section 169A of the Act requires states to develop SIPs containing long-term strategies for remedying existing and preventing future visibility impairment in 156 mandatory Class I federal areas. In order to develop long-term strategies to address regional haze, many States will need to conduct regional-scale modeling of fine particulate concentrations and associated visibility impairment (*e.g.*, light extinction and deciview metrics).

d. To calculate the potential impact of a plume of specified emissions for specific transport and dispersion conditions ("plume blight"), a screening model, VISCREEN, and guidance are available.[70] If a more comprehensive analysis is required, a refined model should be selected . The model selection (VISCREEN vs. PLUVUE II or some other refined model), procedures, and analyses should be determined in consultation with the appropriate reviewing authority (paragraph 3.0(b)) and the affected Federal Land Manager (FLM). FLMs are responsible for determining whether there is an adverse effect by a plume on a Class I area.

e. CALPUFF (Section A.3) may be applied when assessment is needed of reasonably attributable haze impairment or atmospheric deposition due to one or a small group of sources. This situation may involve more sources and larger modeling domains than that to which VISCREEN ideally may be applied. The procedures and analyses should be determined in consultation with the appropriate reviewing authority (paragraph 3.0(b)) and the affected FLM(s).

f. Regional scale models are used by EPA to develop and evaluate national policy and assist State and local control agencies. Two such models which can be used to assess visibility impacts from source emissions are Models-3/CMAQ[47] and REMSAD.[50] Model users should consult with the appropriate reviewing authority (paragraph 3.0(b)), which in this instance would include FLMs.

7.2.2 Good Engineering Practice Stack Height

a. The use of stack height credit in excess of Good Engineering Practice (GEP) stack height or credit resulting from any other dispersion technique is prohibited in the development of emission limitations by 40 CFR 51.118 and 40 CFR 51.164. The definitions of GEP stack height and dispersion technique are contained in 40 CFR 51.100. Methods and procedures for making the appropriate stack height calculations, determining stack height credits and an example of applying those techniques are found in several references [71, 72, 73, 74], which provide a great deal of additional information for evaluating and describing building cavity and wake effects.

b. If stacks for new or existing major sources are found to be less than the height defined by EPA's refined formula for determining GEP height, then air quality impacts associated with cavity or wake effects due to the nearby building structures should be determined. The EPA refined formula height is defined as H + 1.5L (see reference 73). Detailed downwash screening procedures [27] for both the cavity and wake regions should be followed. If more refined concentration estimates are required, the recommended steady-state plume dispersion model in subsection 4.2.2 contains algorithms for building wake calculations and should be used.

7.2.3 Long Range Transport (LRT) (*i.e.*, Beyond 50km)

a. Section 165(d) of the Clean Air Act requires that suspected adverse impacts on PSD Class I areas be determined. However, 50km is the useful distance to which most steady-state Gaussian plume models are considered accurate for setting emission limits. Since in many cases PSD analyses show that Class I areas may be threatened at distances greater than 50km from new sources, some procedure is needed to (1) determine if an adverse impact will occur, and (2) identify the model to be used in setting an emission limit if the Class I increments are threatened. In addition to the situations just described, there are certain applications containing a mixture of both long range and short range source-receptor relationships in a large modeled domain (*e.g.*, several industrialized areas located along a river or valley). Historically, these applications have presented considerable difficulty to an analyst if impacts from sources having transport distances greater than 50km significantly contributed to the design concentrations. To properly analyze applications of this type, a modeling approach is needed which has the capability of combining, in a consistent manner, impacts involving both short and long range transport. The CALPUFF modeling system, listed in Appendix A, has been designed to accommodate both the Class I area LRT situation and the large modeling domain situation. Given the judgement and refinement involved, conducting a LRT modeling assessment will require significant consultation with the appropriate reviewing authority (paragraph 3.0(b)) and the affected FLM(s). The FLM has an affirmative responsibility to protect air quality related values (AQRVs) that may be affected, and to provide the appropriate procedures and analysis techniques. Where there is no increment violation, the ultimate decision on whether a Class I area is adversely affected is the responsibility of the appropriate reviewing authority (Section 165(d)(2)(C)(ii) of the Clean Air Act), taking into consideration any information on the impacts on AQRVs provided by the FLM. According to Section 165(d)(2)(C)(iii) of the Clean Air Act, if there is a Class I increment violation, the *source* must demonstrate to the satisfaction of the FLM that the emissions from the source will have no adverse impact on the AQRVs.

b. If LRT is determined to be important, then refined estimates utilizing the CALPUFF modeling system should be obtained. A screening approach [67, 75] is also available for use on a case-by-case basis that generally provides concentrations that are higher than those obtained using refined characterizations of the meteorological conditions. The meteorological input data requirements for developing the time and space varying three-dimensional winds and dispersion meteorology for refined analyses are discussed in paragraph 9.3.1.2(d). Additional information on applying this model is contained in Appendix A. To facilitate use of complex air quality and meteorological modeling systems, a written protocol approved by the appropriate reviewing authority (paragraph 3.0(b)) and the affected FLM(s) may be considered for developing consensus in the methods and procedures to be followed.

7.2.4 Modeling Guidance for Other Governmental Programs

a. When using the models recommended or discussed in the *Guideline* in support of programmatic requirements not specifically covered by EPA regulations, the model user should consult the appropriate Federal or State agency to ensure the proper application and use of the models. For modeling associated with PSD permit applications that involve a Class I area, the appropriate Federal Land Manager should be consulted on all modeling questions.

b. The Offshore and Coastal Dispersion (OCD) model, described in Appendix A, was developed by the Minerals Management Service and is recommended for estimating air quality impact from offshore sources on onshore, flat terrain areas. The OCD model is not recommended for use in air quality impact assessments for onshore sources. Sources located on or just inland of a shoreline where fumigation is expected should be treated in accordance with subsection 8.2.8.

c. The Emissions and Dispersion Modeling System (EDMS), described in Appendix A, was developed by the Federal Aviation Administration and the United States Air Force and is recommended for air quality assessment of primary pollutant impacts at airports or air bases. Regulatory application of EDMS is intended for estimating the cumulative effect of changes in aircraft operations, point source, and mobile source emissions on pollutant concentrations. It is not intended for PSD, SIP, or other regulatory air quality analyses of point or mobile sources at or peripheral to airport property that are independent of changes in aircraft operations. If changes in other than aircraft operations are associated with analyses, a model recommended in Chapter 4 or 5 should be used.

8.0 General Modeling Considerations

8.1 Discussion

a. This section contains recommendations concerning a number of different issues not explicitly covered in other sections of this guide. The topics covered here are not specific to any one program or modeling area but are common to nearly all modeling analyses for criteria pollutants.

8.2 Recommendations

8.2.1 Design Concentrations (see also subsection 11.2.3.1)

8.2.1.1 Design Concentrations for SO_2, PM–10, CO, Pb, and NO_2

a. An air quality analysis for SO_2, PM–10, CO, Pb, and NO_2 is required to determine if the source will (1) cause a violation of the NAAQS, or (2) cause or contribute to air quality deterioration greater than the specified allowable PSD increment. For the former, background concentration (subsection 9.2) should be added to the estimated impact of the source to determine the design concentration. For the latter, the design concentration includes impact from all increment consuming sources.

b. If the air quality analyses are conducted using the period of meteorological input data recommended in subsection 9.3.1.2 (*e.g.*, 5 years of National Weather Service (NWS) data or at least 1 year of site specific data; subsection 9.3.3), then the design concentration based on the highest, second-highest short term concentration or the highest long term average, whichever is controlling, should be used to determine emission limitations to assess compliance with the NAAQS and PSD increments.

c. When sufficient and representative data exist for less than a 5-year period from a nearby NWS site, or when site specific data have been collected for less than a full continuous year, or when it has been determined that the site specific data may not be temporally representative (subsection 9.3.3), then the highest concentration estimate should be considered the design value. This is because the length of the data record may be too short to assure that the conditions producing worst-case estimates have been adequately sampled. The highest value is then a surrogate for the concentration that is not to be exceeded more than once per year (the wording of the deterministic standards). Also, the highest concentration should be used whenever selected worst-case conditions are input to a screening technique, as described in EPA guidance.[17]

d. If the controlling concentration is an annual average value and multiple years of data (site specific or NWS) are used, then the design value is the highest of the annual averages calculated for the individual years. If the controlling concentration is a quarterly average and multiple years are used, then the highest individual quarterly average should be considered the design value.

e. As long a period of record as possible should be used in making estimates to determine design values and PSD increments. If more than 1 year of site specific data is available, it should be used.

8.2.1.2 Design Concentrations for O_3 and PM–2.5

a. Guidance and specific instructions for the determination of the 1-hr and 8-hr design concentrations for ozone are provided in Appendix H and I (respectively) of reference

4. Appendix H explains how to determine when the expected number of days per calendar year with maximum hourly concentrations above the NAAQS is equal to or less than 1. Appendix I explains the data handling conventions and computations necessary for determining whether the 8-hour primary and secondary NAAQS are met at an ambient monitoring site. For PM–2.5, Appendix N of reference 4, and supplementary guidance [76], explain the data handling conventions and computations necessary for determining when the annual and 24-hour primary and secondary NAAQS are met. For all SIP revisions the user should check with the Regional Office to obtain the most recent guidance documents and policy memoranda concerning the pollutant in question. There are currently no PSD increments for O_3 and PM–2.5.

8.2.2 Critical Receptor Sites

a. Receptor sites for refined modeling should be utilized in sufficient detail to estimate the highest concentrations and possible violations of a NAAQS or a PSD increment. In designing a receptor network, the emphasis should be placed on receptor resolution and location, not total number of receptors. The selection of receptor sites should be a case-by-case determination taking into consideration the topography, the climatology, monitor sites, and the results of the initial screening procedure. For large sources (those equivalent to a 500MW power plant) and where violations of the NAAQS or PSD increment are likely, 360 receptors for a polar coordinate grid system and 400 receptors for a rectangular grid system, where the distance from the source to the farthest receptor is 10km, are usually adequate to identify areas of high concentration. Additional receptors may be needed in the high concentration location if greater resolution is indicated by terrain or source factors.

8.2.3 Dispersion Coefficients

a. Steady-state Gaussian plume models used in most applications should employ dispersion coefficients consistent with those contained in the preferred models in Appendix A. Factors such as averaging time, urban/rural surroundings (see paragraphs (b)–(f) of this subsection), and type of source (point vs. line) may dictate the selection of specific coefficients. Coefficients used in some Appendix A models are identical to, or at least based on, Pasquill-Gifford coefficients [77] in rural areas and McElroy-Pooler [78] coefficients in urban areas.[79]

b. The selection of either rural or urban dispersion coefficients in a specific application should follow one of the procedures suggested by Irwin [80] and briefly described in paragraphs (c)–(f) of this subsection. These include a land use classification procedure or a population based procedure to determine whether the character of an area is primarily urban or rural.

c. Land Use Procedure: (1) Classify the land use within the total area, A_o, circumscribed by a 3km radius circle about the source using the meteorological land use typing scheme proposed by Auer [81]; (2) if land use types I1, I2, C1, R2, and R3 account for 50 percent or more of A_o, use urban dispersion coefficients; otherwise, use appropriate rural dispersion coefficients.

d. Population Density Procedure: (1) Compute the average population density, $\bar{p}$ per square kilometer with A_o as defined above; (2) If $\bar{p}$ is greater than 750 people/km^2, use urban dispersion coefficients; otherwise use appropriate rural dispersion coefficients.

e. Of the two methods, the land use procedure is considered more definitive. Population density should be used with caution and should not be applied to highly industrialized areas where the population density may be low and thus a rural classification would be indicated, but the area is sufficiently built-up so that the urban land use criteria would be satisfied. In this case, the classification should already be "urban" and urban dispersion parameters should be used.

f. Sources located in an area defined as urban should be modeled using urban dispersion parameters. Sources located in areas defined as rural should be modeled using the rural dispersion parameters. For analyses of whole urban complexes, the entire area should be modeled as an urban region if most of the sources are located in areas classified as urban.

g. Buoyancy-induced dispersion (BID), as identified by Pasquill [82], is included in the preferred models and should be used where buoyant sources, *e.g.*, those involving fuel combustion, are involved.

8.2.4 Stability Categories

a. The Pasquill approach to classifying stability is commonly used in preferred models (Appendix A). The Pasquill method, as modified by Turner [83], was developed for use with commonly observed meteorological data from the National Weather Service and is based on cloud cover, insolation and wind speed.

b. Procedures to determine Pasquill stability categories from other than NWS data are found in subsection 9.3. Any other method to determine Pasquill stability categories must be justified on a case-by-case basis.

c. For a given model application where stability categories are the basis for selecting dispersion coefficients, both σ_y and σ_z should be determined from the same stability category. "Split sigmas" in that instance are not recommended. Sector averaging, which eliminates the σ_y term, is commonly acceptable in complex terrain screening methods.

8.2.5 Plume Rise

a. The plume rise methods of Briggs [84,85] are incorporated in many of the preferred models and are recommended for use in many modeling applications. In the convective boundary layer, plume rise is superposed on the displacements by random convective velocities.[86] No explicit provisions in these models are made for multistack plume rise enhancement or the handling of such special plumes as flares; these problems should be considered on a case-by-case basis.

b. Gradual plume rise is generally recommended where its use is appropriate: (1) In complex terrain screening procedures to determine close-in impacts and (2) when calculating the effects of building wakes. If the building wake is calculated to affect the plume for any hour, gradual plume rise is also used in downwind dispersion calculations to the distance of final plume rise, after which final plume rise is used. Plumes captured by the near wake are re-emitted to the far wake as a ground-level volume source.

c. Stack tip downwash generally occurs with poorly constructed stacks and when the ratio of the stack exit velocity to wind speed is small. An algorithm developed by Briggs [85] is the recommended technique for this situation and is found in the point source preferred models.

8.2.6 Chemical Transformation

a. The chemical transformation of SO_2 emitted from point sources or single industrial plants in rural areas is generally assumed to be relatively unimportant to the estimation of maximum concentrations when travel time is limited to a few hours. However, in urban areas, where synergistic effects among pollutants are of considerable consequence, chemical transformation rates may be of concern. In urban area applications, a half-life of 4 hours [83] may be applied to the analysis of SO_2 emissions. Calculations of transformation coefficients from site specific studies can be used to define a "half-life" to be used in a steady-state Gaussian plume model with any travel time, or in any application, if appropriate documentation is provided. Such conversion factors for pollutant half-life should not be used with screening analyses.

b. Use of models incorporating complex chemical mechanisms should be considered only on a case-by-case basis with proper demonstration of applicability. These are generally regional models not designed for the evaluation of individual sources but used primarily for region-wide evaluations. Visibility models also incorporate chemical transformation mechanisms which are an integral part of the visibility model itself and should be used in visibility assessments.

8.2.7 Gravitational Settling and Deposition

a. An "infinite half-life" should be used for estimates of particle concentrations when steady-state Gaussian plume models containing only exponential decay terms for treating settling and deposition are used.

b. Gravitational settling and deposition may be directly included in a model if either is a significant factor. When particulate matter sources can be quantified and settling and dry deposition are problems, professional judgement should be used, and there should be coordination with the appropriate reviewing authority (paragraph 3.0(b)).

8.2.8 Complex Winds

a. *Inhomogeneous Local Winds.* In many parts of the United States, the ground is neither flat nor is the ground cover (or land use) uniform. These geographical variations can generate local winds and circulations, and modify the prevailing ambient winds and circulations. Geographic effects are most apparent when the ambient winds are light or calm.[87] In general these geographically induced wind circulation effects are named after the source location of the winds, *e.g.*, lake and sea breezes, and mountain and valley winds. In very rugged hilly or mountainous terrain, along coastlines, or near large land use variations, the characterization of the winds is a balance of various forces, such that the assumptions of steady-state straight-line transport both in time and space are inappropriate. In the special cases described, the CALPUFF modeling system (described in Appendix A) may be applied on a case-by-case basis for air quality estimates in such complex non-steady-state meteorological conditions. The purpose of choosing a modeling system like CALPUFF is to fully treat the time and space variations of meteorology effects on transport and dispersion. The setup and application of the model should be determined in consultation with the appropriate reviewing authority (paragraph 3.0(b)) consistent with limitations of paragraph 3.2.2(e). The meteorological input data requirements for developing the time and space varying three-dimensional winds and dispersion meteorology for these situations are discussed in paragraph 9.3.1.2(d). Examples of inhomogeneous winds include, but aren't limited to, situations described in the following paragraphs (i)–(iii):

i. *Inversion Breakup Fumigation.* Inversion breakup fumigation occurs when a plume (or multiple plumes) is emitted into a stable layer of air and that layer is subsequently mixed to the ground through convective transfer of heat from the surface or because of advection to less stable surroundings. Fumigation may cause excessively high concentrations but is usually rather short-lived at a given receptor. There are no recommended refined techniques to model this phenomenon. There are, however, screening procedures [27] that may be used to approximate the concentrations. Considerable care should be exercised in using the results obtained from the screening techniques.

ii. *Shoreline Fumigation.* Fumigation can be an important phenomenon on and near the shoreline of bodies of water. This can affect both individual plumes and area-wide emissions. When fumigation conditions are expected to occur from a source or sources with tall stacks located on or just inland of a shoreline, this should be addressed in the air quality modeling analysis. The Shoreline Dispersion Model (SDM) listed on EPA's Internet SCRAM Web site (subsection 2.3) may be applied on a case-by-case basis when air quality estimates under shoreline fumigation conditions are needed.[88] Information on the results of EPA's evaluation of this model together with other coastal fumigation models is available.[89] Selection of the appropriate model for applications where shoreline fumigation is of concern should be determined in consultation with the appropriate reviewing authority (paragraph 3.0(b)).

iii. *Stagnation.* Stagnation conditions are characterized by calm or very low wind speeds, and variable wind directions. These stagnant meteorological conditions may persist for several hours to several days. During stagnation conditions, the dispersion of air pollutants, especially those from low-level emissions sources, tends to be minimized, potentially leading to relatively high ground-level concentrations. If point sources are of interest, users should note the guidance provided for CALPUFF in paragraph (a) of this subsection. Selection of the appropriate model for applications where stagnation is of concern should be determined in consultation with the appropriate reviewing authority (paragraph 3.0(b)).

8.2.9 Calibration of Models

a. Calibration of models is not common practice and is subject to much error and misunderstanding. There have been attempts by some to compare model estimates and measurements on an event-by-event basis and then to calibrate a model with results of that comparison. This approach is severely limited by uncertainties in both source and meteorological data and therefore it is difficult to precisely estimate the concentration at an exact location for a specific increment of time. Such uncertainties make calibration of models of questionable benefit. Therefore, model calibration is unacceptable.

9.0 Model Input Data

a. Data bases and related procedures for estimating input parameters are an integral part of the modeling procedure. The most appropriate data available should always be selected for use in modeling analyses. Concentrations can vary widely depending on the source data or meteorological data used. Input data are a major source of uncertainties in any modeling analysis. This section attempts to minimize the uncertainty associated with data base selection and use by identifying requirements for data used in modeling. A checklist of input data requirements for modeling analyses is posted on EPA's Internet SCRAM Web site (subsection 2.3). More specific data requirements and the format required for the individual models are described in detail in the users' guide for each model.

9.1 Source Data

9.1.1 Discussion

a. Sources of pollutants can be classified as point, line and area/volume sources. Point sources are defined in terms of size and may vary between regulatory programs. The line sources most frequently considered are roadways and streets along which there are well-defined movements of motor vehicles, but they may be lines of roof vents or stacks such as in aluminum refineries. Area and volume sources are often collections of a multitude of minor sources with individually small emissions that are impractical to consider as separate point or line sources. Large area sources are typically treated as a grid network of square areas, with pollutant emissions distributed uniformly within each grid square.

b. Emission factors are compiled in an EPA publication commonly known as AP–42 [90]; an indication of the quality and amount of data on which many of the factors are based is also provided. Other information concerning emissions is available in EPA publications relating to specific source categories. The appropriate reviewing authority (paragraph 3.0(b)) should be consulted to determine appropriate source definitions and for guidance concerning the determination of emissions from and techniques for modeling the various source types.

9.1.2 Recommendations

a. For point source applications the load or operating condition that causes maximum ground-level concentrations should be established. As a minimum, the source should be modeled using the design capacity (100 percent load). If a source operates at greater than design capacity for periods that could result in violations of the standards or PSD increments, this load [2] should be modeled. Where the source operates at substantially less than design capacity, and the changes in the stack parameters associated with the operating conditions could lead to higher ground level concentrations, loads such as 50 percent and 75 percent of capacity should also be modeled. A range of operating conditions should be considered in screening analyses; the load causing the highest concentration, in addition to the design load, should be included in refined modeling. For a steam power plant, the following (b–h) is typical of the kind of data on source characteristics and operating conditions that may be needed. Generally, input data requirements for air quality models necessitate the use of metric units; where English units are common for engineering usage, a conversion to metric is required.

b. *Plant layout.* The connection scheme between boilers and stacks, and the distance and direction between stacks, building parameters (length, width, height, location and orientation relative to stacks) for plant structures which house boilers, control equipment, and surrounding buildings within a distance of approximately five stack heights.

c. *Stack parameters.* For all stacks, the stack height and inside diameter (meters), and the temperature (K) and volume flow rate (actual cubic meters per second) or exit gas velocity (meters per second) for operation at 100 percent, 75 percent and 50 percent load.

d. *Boiler size.* For all boilers, the associated megawatts, 10^6 BTU/hr, and pounds of steam per hour, and the design and/or actual fuel consumption rate for 100 percent load for coal (tons/hour), oil (barrels/hour), and natural gas (thousand cubic feet/hour).

e. *Boiler parameters.* For all boilers, the percent excess air used, the boiler type (*e.g.*, wet bottom, cyclone, etc.), and the type of firing (*e.g.*, pulverized coal, front firing, etc.).

f. *Operating conditions.* For all boilers, the type, amount and pollutant contents of fuel, the total hours of boiler operation and the boiler capacity factor during the year, and the percent load for peak conditions.

[2] Malfunctions which may result in excess emissions are not considered to be a normal operating condition. They generally should not be considered in determining allowable emissions. However, if the excess emissions are the result of poor maintenance, careless operation, or other preventable conditions, it may be necessary to consider them in determining source impact.

g. *Pollution control equipment parameters.* For each boiler served and each pollutant affected, the type of emission control equipment, the year of its installation, its design efficiency and mass emission rate, the date of the last test and the tested efficiency, the number of hours of operation during the latest year, and the best engineering estimate of its projected efficiency if used in conjunction with coal combustion; data for any anticipated modifications or additions.

h. *Data for new boilers or stacks.* For all new boilers and stacks under construction and for all planned modifications to existing boilers or stacks, the scheduled date of completion, and the data or best estimates available for items (b) through (g) of this subsection following completion of construction or modification.

i. In stationary point source applications for compliance with short term ambient standards, SIP control strategies should be tested using the emission input shown on Table 9–1. When using a refined model, sources should be modeled sequentially with these loads for every hour of the year. To evaluate SIPs for compliance with quarterly and annual standards, emission input data shown in Table 9–1 should again be used. Emissions from area sources should generally be based on annual average conditions. The source input information in each model user's guide should be carefully consulted and the checklist (paragraph 9.0(a)) should also be consulted for other possible emission data that could be helpful. PSD and NAAQS compliance demonstrations should follow the emission input data shown in Table 9–2. For purposes of emissions trading, new source review and demonstrations, refer to current EPA policy and guidance to establish input data.

j. Line source modeling of streets and highways requires data on the width of the roadway and the median strip, the types and amounts of pollutant emissions, the number of lanes, the emissions from each lane and the height of emissions. The location of the ends of the straight roadway segments should be specified by appropriate grid coordinates. Detailed information and data requirements for modeling mobile sources of pollution are provided in the user's manuals for each of the models applicable to mobile sources.

k. The impact of growth on emissions should be considered in all modeling analyses covering existing sources. Increases in emissions due to planned expansion or planned fuel switches should be identified. Increases in emissions at individual sources that may be associated with a general industrial/commercial/residential expansion in multi-source urban areas should also be treated. For new sources the impact of growth on emissions should generally be considered for the period prior to the start-up date for the source. Such changes in emissions should treat increased area source emissions, changes in existing point source emissions which were not subject to preconstruction review, and emissions due to sources with permits to construct that have not yet started operation.

TABLE 9–1.—MODEL EMISSION INPUT DATA FOR POINT SOURCES [1]

Averaging time	Emission limit (#/MMBtu) [2]	×	Operating level (MMBtu/hr) [2]	×	Operating factor (*e.g.*, hr/yr, hr/day)
Stationary Point Source(s) Subject to SIP Emission Limit(s) Evaluation for Compliance With Ambient Standards (Including Areawide Demonstrations)					
Annual & quarterly	Maximum allowable emission limit or federally enforceable permit limit.		Actual or design capacity (whichever is greater), or federally enforceable permit condition.		Actual operating factor averaged over most recent 2 years.[3]
Short term	Maximum allowable emission limit or federally enforceable permit limit.		Actual or design capacity (whichever is greater), or federally enforceable permit condition.[4]		Continuous operation, *i.e.*, all hours of each time period under consideration (for all hours of the meteorological data base).[5]
Nearby Source(s) [6,7] Same input requirements as for stationary point source(s) above.					
Other Sources [7] If modeled (subsection 9.2.3), input data requirements are defined below.					
Annual & quarterly	Maximum allowable emission limit or federally enforceable permit limit.[6]		Annual level when actually operating, averaged over the most recent 2 years.[3]		Actual operating factor averaged over the most recent 2 years.[3]
Short term	Maximum allowable emission limit or federally enforceable permit limit.[6]		Annual level when actually operating, averaged over the most recent 2 years.[3]		Continuous operation, *i.e.*, all hours of each time period under consideration (for all hours of the meteorological data base).[5]

[1] The model input data requirements shown on this table apply to stationary source control strategies for STATE IMPLEMENTATION PLANS. For purposes of emissions trading, new source review, or prevention of significant deterioration, other model input criteria may apply. Refer to the policy and guidance for these programs to establish the input data.

[2] Terminology applicable to fuel burning sources; analogous terminology (*e.g.*, #/throughput) may be used for other types of sources.

[3] Unless it is determined that this period is not representative.

[4] Operating levels such as 50 percent and 75 percent of capacity should also be modeled to determine the load causing the highest concentration.

[5] If operation does not occur for all hours of the time period of consideration (*e.g.*, 3 or 24 hours) and the source operation is constrained by a federally enforceable permit condition, an appropriate adjustment to the modeled emission rate may be made (*e.g.*, if operation is only 8 a.m. to 4 p.m. each day, only these hours will be modeled with emissions from the source. Modeled emissions should not be averaged across non-operating time periods.)

[6] *See* paragraph 9.2.3(c).

[7] *See* paragraph 9.2.3(d).

TABLE 9–2.—POINT SOURCE MODEL INPUT DATA (EMISSIONS) FOR PSD NAAQS COMPLIANCE DEMONSTRATIONS

Averaging time	Emission limit (#/MMBtu) [1]	×	Operating level (MMBtu/hr) [1]	×	Operating factor (e.g., hr/yr,hr/day)
			Proposed Major New or Modified Source		
Annual & quarterly	Maximum allowable emission limit or federally enforceable permit limit.		Design capacity or federally enforceable permit condition.		Continuous operation (i.e., 8760 hours).[2]
Short term (≤ 24 hours)	Maximum allowable emission limit or federally enforceable permit limit.		Design capacity or federally enforceable permit condition.[3]		Continuous operation (i.e., all hours of each time period under consideration) (for all hours of the meteorological data base).[2]
			Nearby Source(s) [4,6]		
Annual & quarterly	Maximum allowable emission limit or federally enforceable permit limit.[5]		Actual or design capacity (whichever is greater), or federally enforceable permit condition.		Actual operating factor averaged over the most recent 2 years.[7,8]
Short term (≤ 24 hours)	Maximum allowable emission limit or federally enforceable permit limit.[6]		Actual or design capacity (whichever is greater), or federally enforceable permit condition.[3]		Continuous operation (i.e., all hours of each time period under consideration) (for all hours of the meteorological data base).[2]
			Other Source(s) [6,9]		
Annual & quarterly	Maximum allowable emission limit or federally enforceable permit limit.[5]		Annual level when actually operating, averaged over the most recent 2 years.[7]		Actual operating factor averaged over the most recent 2 years.[7,8]
Short term (≤ 24 hours)	Maximum allowable emission limit or federally enforceable permit limit.[5]		Annual level when actually operating, averaged over the most recent 2 years.[7]		Continuous operation (i.e., all hours of each time period under consideration) (for all hours of the meteorological data base).[2]

[1] Terminology applicable to fuel burning sources; analogous terminology (e.g., #/throughput) may be used for other types of sources.
[2] If operation does not occur for all hours of the time period of consideration (e.g., 3 or 24 hours) and the source operation is constrained by a federally enforceable permit condition, an appropriate adjustment to the modeled emission rate may be made (e.g., if operation is only 8 a.m. to 4 p.m. each day, only these hours will be modeled with emissions from the source. Modeled emissions should not be averaged across non-operating time periods.
[3] Operating levels such as 50 percent and 75 percent of capacity should also be modeled to determine the load causing the highest concentration.
[4] Includes existing facility to which modification is proposed if the emissions from the existing facility will not be affected by the modification. Otherwise use the same parameters as for major modification.
[5] *See* paragraph 9.2.3(c).
[6] *See* paragraph 9.2.3(d).
[7] Unless it is determined that this period is not representative.
[8] For those permitted sources not in operation or that have not established an appropriate factor, continuous operation (i.e., 8760) should be used.
[9] Generally, the ambient impacts from non-nearby (background) sources can be represented by air quality data unless adequate data do not exist.

9.2 Background Concentrations

9.2.1 Discussion

a. Background concentrations are an essential part of the total air quality concentration to be considered in determining source impacts. Background air quality includes pollutant concentrations due to: (1) Natural sources; (2) nearby sources other than the one(s) currently under consideration; and (3) unidentified sources.

b. Typically, air quality data should be used to establish background concentrations in the vicinity of the source(s) under consideration. The monitoring network used for background determinations should conform to the same quality assurance and other requirements as those networks established for PSD purposes.[81] An appropriate data validation procedure should be applied to the data prior to use.

c. If the source is not isolated, it may be necessary to use a multi-source model to establish the impact of nearby sources. Since sources don't typically operate at their maximum allowable capacity (which may include the use of "dirtier" fuels), modeling is necessary to express the potential contribution of background sources, and this impact would not be captured via monitoring. Background concentrations should be determined for each critical (concentration) averaging time.

9.2.2 Recommendations (Isolated Single Source)

a. Two options (paragraph (b) or (c) of this section) are available to determine the background concentration near isolated sources.

b. Use air quality data collected in the vicinity of the source to determine the background concentration for the averaging times of concern. Determine the mean background concentration at each monitor by excluding values when the source in question is impacting the monitor. The mean annual background is the average of the annual concentrations so determined at each monitor. For shorter averaging periods, the meteorological conditions accompanying the concentrations of concern should be identified. Concentrations for meteorological conditions of concern, at monitors not impacted by the source in question, should be averaged for each separate averaging time to determine the average background value. Monitoring sites inside a 90° sector downwind of the source may be used to determine the area of impact. One hour concentrations may be added and averaged to determine longer averaging periods.

c. If there are no monitors located in the vicinity of the source, a "regional site" may be used to determine background. A "regional site" is one that is located away from the area of interest but is impacted by similar natural and distant man-made sources.

9.2.3 Recommendations (Multi-Source Areas)

a. In multi-source areas, two components of background should be determined: Contributions from nearby sources and contributions from other sources.

b. *Nearby Sources:* All sources expected to cause a significant concentration gradient in the vicinity of the source or sources under consideration for emission limit(s) should be explicitly modeled. The number of such sources is expected to be small except in unusual situations. Owing to both the uniqueness of each modeling situation and the large number of variables involved in identifying nearby sources, no attempt is made here to comprehensively define this term. Rather, identification of nearby sources calls for the exercise of professional judgement by the appropriate reviewing authority (paragraph 3.0(b)). This guidance is not intended to alter the exercise of that judgement or to comprehensively define which sources are nearby sources.

c. For compliance with the short-term and annual ambient standards, the nearby sources as well as the primary source(s) should be evaluated using an appropriate Appendix A model with the emission input data shown in Table 9–1 or 9–2. When modeling a nearby source that does not have a permit and the emission limit contained in the SIP for a particular source category is greater than the emissions possible given the source's maximum physical capacity to emit, the "maximum allowable emission limit" for such a nearby source may be calculated as the emission rate representative of the nearby source's maximum physical capacity to emit, considering its design specifications and allowable fuels and process materials. However, the burden is on the permit applicant to sufficiently document what the maximum physical capacity to emit is for such a nearby source.

d. It is appropriate to model nearby sources only during those times when they, by their nature, operate at the same time as the primary source(s) being modeled. Where a primary source believes that a nearby source does not, by its nature, operate at the same time as the primary source being modeled, the burden is on the primary source to demonstrate to the satisfaction of the appropriate reviewing authority (paragraph 3.0(b)) that this is, in fact, the case. Whether or not the primary source has adequately demonstrated that fact is a matter of professional judgement left to the discretion of the appropriate reviewing authority. The following examples illustrate two cases in which a nearby source may be shown not to operate at the same time as the primary source(s) being modeled. Some sources are only used during certain seasons of the year. Those sources would not be modeled as nearby sources during times in which they do not operate. Similarly, emergency backup generators that never operate simultaneously with the sources that they back up would not be modeled as nearby sources. To reiterate, in these examples and other appropriate cases, the burden is on the primary source being modeled to make the appropriate demonstration to the satisfaction of the appropriate reviewing authority.

e. The impact of the nearby sources should be examined at locations where interactions between the plume of the point source under consideration and those of nearby sources (plus natural background) can occur. Significant locations include: (1) The area of maximum impact of the point source; (2) the area of maximum impact of nearby sources; and (3) the area where all sources combine to cause maximum impact. These locations may be identified through trial and error analyses.

f. *Other Sources:* That portion of the background attributable to all other sources (*e.g.*, natural sources, minor sources and distant major sources) should be determined by the procedures found in subsection 9.2.2 or by application of a model using Table 9–1 or 9–2.

9.3 Meteorological Input Data

a. The meteorological data used as input to a dispersion model should be selected on the basis of spatial and climatological (temporal) representativeness as well as the ability of the individual parameters selected to characterize the transport and dispersion conditions in the area of concern. The representativeness of the data is dependent on: (1) The proximity of the meteorological monitoring site to the area under consideration; (2) the complexity of the terrain; (3) the exposure of the meteorological monitoring site; and (4) the period of time during which data are collected. The spatial representativeness of the data can be adversely affected by large distances between the source and receptors of interest and the complex topographic characteristics of the area. Temporal representativeness is a function of the year-to-year variations in weather conditions. Where appropriate, data representativeness should be viewed in terms of the appropriateness of the data for constructing realistic boundary layer profiles and three dimensional meteorological fields, as described in paragraphs (c) and (d) below.

b. Model input data are normally obtained either from the National Weather Service or as part of a site specific measurement program. Local universities, Federal Aviation Administration (FAA), military stations, industry and pollution control agencies may also be sources of such data. Some recommendations for the use of each type of data are included in this subsection.

c. For long range transport modeling assessments (subsection 7.2.3) or for assessments where the transport winds are complex and the application involves a non-steady-state dispersion model (subsection 8.2.8), use of output from prognostic mesoscale meteorological models is encouraged.[92, 93, 94] Some diagnostic meteorological processors are designed to appropriately blend available NWS comparable meteorological observations, local site specific meteorological observations, and prognostic mesoscale meteorological data, using empirical relationships, to diagnostically adjust the wind field for mesoscale and local-scale effects. These diagnostic adjustments can sometimes be improved through the use of strategically placed site specific meteorological observations. The placement of these special meteorological observations (often more than one location is needed) involves expert judgement, and is specific to the terrain and land use of the modeling domain. Acceptance for use of output from prognostic mesoscale meteorological models is contingent on concurrence by the appropriate reviewing authorities (paragraph 3.0(b)) that the data are of acceptable quality, which can be demonstrated through statistical comparisons with observations of winds aloft and at the surface at several appropriate locations.

9.3.1 Length of Record of Meteorological Data

9.3.1.1 Discussion

a. The model user should acquire enough meteorological data to ensure that worst-case meteorological conditions are adequately represented in the model results. The trend toward statistically based standards suggests a need for all meteorological conditions to be adequately represented in the data set selected for model input. The number of years of record needed to obtain a stable distribution of conditions depends on the variable being measured and has been estimated by Landsberg and Jacobs[95] for various parameters. Although that study indicates in excess of 10 years may be required to achieve stability in the frequency distributions of some meteorological variables, such long periods are not reasonable for model input data. This is due in part to the fact that hourly data in model input format are frequently not available for such periods and that hourly calculations of concentration for long periods may be prohibitively expensive. Another study[96] compared various periods from a 17-year data set to determine the minimum number of years of data needed to approximate the concentrations modeled with a 17-year period of meteorological data from one station. This study indicated that the variability of model estimates due to the meteorological data input was adequately reduced if a 5-year period of record of meteorological input was used.

9.3.1.2 Recommendations

a. Five years of representative meteorological data should be used when estimating concentrations with an air quality model. Consecutive years from the most recent, readily available 5-year period are preferred. The meteorological data should be *adequately representative*, and may be site specific or from a nearby NWS station. Where professional judgment indicates NWS-collected ASOS (automated surface observing stations) data are inadequate (for cloud cover observations, the most recent 5 years of NWS data that are observer-based may be considered for use.

b. The use of 5 years of NWS meteorological data or at least 1 year of site specific data is required. If one year or more (including partial years), up to five years, of site specific data is available, these data are preferred for use in air quality analyses. Such data should have been subjected to quality assurance procedures as described in subsection 9.3.3.2.

c. For permitted sources whose emission limitations are based on a specific year of meteorological data, that year should be added to any longer period being used (*e.g.*, 5 years of NWS data) when modeling the facility at a later time.

d. For LRT situations (subsection 7.2.3) and for complex wind situations (paragraph 8.2.8(a)), if only NWS or comparable standard meteorological observations are employed, five years of meteorological data (within and near the modeling domain) should be used. Consecutive years from the most recent, readily available 5-year period are preferred. Less than five, but at least three, years of meteorological data (need not be consecutive) may be used if mesoscale meteorological fields are available, as discussed in paragraph 9.3(c). These mesoscale meteorological fields should be used in conjunction with available standard NWS or comparable meteorological observations within and near the modeling domain. If site specific meteorological data are available, these data may be especially helpful for local-scale complex wind situations, when appropriately blended together with standard NWS or comparable observations and mesoscale meteorological fields.

9.3.2 National Weather Service Data

9.3.2.1 Discussion

a. The NWS meteorological data are routinely available and familiar to most model users. Although the NWS does not provide direct measurements of all the needed dispersion model input variables, methods have been developed and successfully used to translate the basic NWS data to the needed model input. Site specific measurements of model input parameters have been made for many modeling studies, and those methods and techniques are becoming more widely applied, especially in situations such as complex terrain applications, where available NWS data are not adequately representative. However, there are many model applications where NWS data are adequately representative, and the applications still rely heavily on the NWS data.

b. Many models use the standard hourly weather observations available from the National Climatic Data Center (NCDC). These observations are then preprocessed before they can be used in the models.

9.3.2.2 Recommendations

a. The preferred models listed in Appendix A all accept as input the NWS meteorological data preprocessed into model compatible form. If NWS data are judged to be adequately representative for a particular modeling application, they may be used. NCDC makes available surface[97,98] and upper air[99] meteorological data in CD–ROM format.

b. Although most NWS measurements are made at a standard height of 10 meters, the actual anemometer height should be used as input to the preferred model.

c. Wind directions observed by the National Weather Service are reported to the nearest 10 degrees. A specific set of randomly generated numbers has been developed for use with the preferred EPA models and should be used with NWS data to ensure a lack of bias in wind direction assignments within the models.

d. Data from universities, FAA, military stations, industry and pollution control agencies may be used if such data are equivalent in accuracy and detail to the NWS data, and they are judged to be adequately representative for the particular application.

9.3.3 Site Specific Data

9.3.3.1 Discussion

a. Spatial or geographical representativeness is best achieved by collection of all of the needed model input data in close proximity to the actual site of the source(s). Site specific measured data are therefore preferred as model input, provided that appropriate instrumentation and quality assurance procedures are followed and that the data collected are adequately representative (free from inappropriate local or microscale influences) and compatible with the input requirements of the model to be used. It should be noted that, while site specific measurements are frequently made "on-property" (*i.e.*, on the source's premises), acquisition of adequately representative site specific data does not preclude collection of data from a location off property. Conversely, collection of meteorological data on a source's property does not of itself guarantee adequate representativeness. For help in determining representativeness of site specific measurements, technical guidance [100] is available. Site specific data should always be reviewed for representativeness and consistency by a qualified meteorologist.

9.3.3.2 Recommendations

a. EPA guidance[100] provides recommendations on the collection and use of site specific meteorological data. Recommendations on characteristics, siting, and exposure of meteorological instruments and on data recording, processing, completeness requirements, reporting, and archiving are also included. This publication should be used as a supplement to other limited guidance on these subjects.[91,101,102] Detailed information on quality assurance is also available.[103] As a minimum, site specific measurements of ambient air temperature, transport wind speed and direction, and the variables necessary to estimate atmospheric dispersion should be available in meteorological data sets to be used in modeling. Care should be taken to ensure that meteorological instruments are located to provide representative characterization of pollutant transport between sources and receptors of interest. The appropriate reviewing authority (paragraph 3.0(b)) is available to help determine the appropriateness of the measurement locations.

b. All site specific data should be reduced to hourly averages. Table 9–3 lists the wind related parameters and the averaging time requirements.

c. *Missing Data Substitution.* After valid data retrieval requirements have been met [100], hours in the record having missing data should be treated according to an established data substitution protocol provided that data from an adequately representative alternative site are available. Such protocols are usually part of the approved monitoring program plan. Data substitution guidance is provided in Section 5.3 of reference 100. If no representative alternative data are available for substitution, the absent data should be coded as missing using missing data codes appropriate to the applicable meteorological pre-processor. Appropriate model options for treating missing data, if available in the model, should be employed.

d. *Solar Radiation Measurements.* Total solar radiation or net radiation should be measured with a reliable pyranometer or net radiometer, sited and operated in accordance with established site specific meteorological guidance.[100,103]

e. *Temperature Measurements.* Temperature measurements should be made at standard shelter height (2m) in accordance with established site specific meteorological guidance.[100]

f. *Temperature Difference Measurements.* Temperature difference (δT) measurements should be obtained using matched thermometers or a reliable thermocouple system to achieve adequate accuracy. Siting, probe placement, and operation of δT systems should be based on guidance found in Chapter 3 of reference 100, and such guidance should be followed when obtaining vertical temperature gradient data.

g. *Winds Aloft.* For simulation of plume rise and dispersion of a plume emitted from a stack, characterization of the wind profile up through the layer in which the plume disperses is required. This is especially important in complex terrain and/or complex wind situations where wind measurements at heights up to hundreds of meters above stack base may be required in some circumstances. For tall stacks when site specific data are needed, these winds have been obtained traditionally using meteorological sensors mounted on tall towers. A feasible alternative to tall towers is the use of meteorological remote sensing instruments (*e.g.*, acoustic sounders or radar wind profilers) to provide winds aloft, coupled with 10-meter towers to provide the near-surface winds. (For specific requirements for CTDMPLUS, see Appendix A.) Specifications for wind measuring instruments and systems are contained in reference 100.

h. *Turbulence.* There are several dispersion models that are capable of using direct measurements of turbulence (wind fluctuations) in the characterization of the vertical and lateral dispersion (*e.g.*, CTDMPLUS and CALPUFF). For specific requirements for CTDMPLUS and CALPUFF, see Appendix A. For technical guidance on measurement and processing of turbulence parameters, see reference 100. When turbulence data are used in this manner to directly characterize the vertical and lateral dispersion, the averaging time for the turbulence measurements should be one hour

(Table 9–3). There are other dispersion models (*e.g.*, BLP, and CALINE3) that employ P–G stability categories for the characterization of the vertical and lateral dispersion. Methods for using site specific turbulence data for the characterization of P–G stability categories are discussed in reference 100. When turbulence data are used in this manner to determine the P–G stability category, the averaging time for the turbulence measurements should be 15 minutes.

i. *Stability Categories.* For dispersion models that employ P–G stability categories for the characterization of the vertical and lateral dispersion (*e.g.*, ISC3), the P–G stability categories, as originally defined, couple near-surface measurements of wind speed with subjectively determined insolation assessments based on hourly cloud cover and ceiling height observations. The wind speed measurements are made at or near 10m. The insolation rate is typically assessed using observations of cloud cover and ceiling height based on criteria outlined by Turner.[77] It is recommended that the P–G stability category be estimated using the Turner method with site specific wind speed measured at or near 10m and representative cloud cover and ceiling height. Implementation of the Turner method, as well as considerations in determining representativeness of cloud cover and ceiling height in cases for which site specific cloud observations are unavailable, may be found in Section 6 of reference 100. In the absence of requisite data to implement the Turner method, the SRDT method or wind fluctuation statistics (*i.e.*, the σ_E and σ_A methods) may be used.

j. The SRDT method, described in Section 6.4.4.2 of reference 100, is modified slightly from that published from earlier work[104] and has been evaluated with three site specific data bases.[105] The two methods of stability classification which use wind fluctuation statistics, the σ_E and σ_A methods, are also described in detail in Section 6.4.4 of reference 100 (note applicable tables in Section 6). For additional information on the wind fluctuation methods, several references are available.[106,107,108,109]

k. *Meteorological Data Preprocessors.* The following meteorological preprocessors are recommended by EPA: PCRAMMET,[110] MPRM,[111] METPRO,[112] and CALMET.[113] PCRAMMET is the recommended meteorological preprocessor for use in applications employing hourly NWS data. MPRM is a general purpose meteorological data preprocessor which supports regulatory models requiring PCRAMMET formatted (NWS) data. MPRM is available for use in applications employing site specific meteorological data. The latest version (MPRM 1.3) has been configured to implement the SRDT method for estimating P–G stability categories. METPRO is the required meteorological data preprocessor for use with CTDMPLUS. CALMET is available for use with applications of CALPUFF. All of the above mentioned data preprocessors are available for downloading from EPA's Internet SCRAM Web site (subsection 2.3).

TABLE 9–3.—AVERAGING TIMES FOR SITE SPECIFIC WIND AND TURBULENCE MEASUREMENTS

Parameter	Averaging time (in hours)
Surface wind speed (for use in stability determinations)	1
Transport direction	1
Dilution wind speed	1
Turbulence measurements (σ_E and σ_A) for use in stability determinations	[1]1
Turbulence Measurements for direct input to dispersion models	1

[1] To minimize meander effects in σ_A when wind conditions are light and/or variable, determine the hourly average σ value from four sequential 15-minute σ's according to the following formula:

$$\sigma_{1\text{-hr}} = \sqrt{\frac{\sigma_{15}^2 + \sigma_{15}^2 + \sigma_{15}^2 + \sigma_{15}^2}{4}}$$

9.3.4 Treatment of Near-calms and Calms

9.3.4.1 Discussion

a. Treatment of calm or light and variable wind poses a special problem in model applications since steady-state Gaussian plume models assume that concentration is inversely proportional to wind speed. Furthermore, concentrations may become unrealistically large when wind speeds less than 1 m/s are input to the model. Procedures have been developed to prevent the occurrence of overly conservative concentration estimates during periods of calms. These procedures acknowledge that a steady-state Gaussian plume model does not apply during calm conditions, and that our knowledge of wind patterns and plume behavior during these conditions does not, at present, permit the development of a better technique. Therefore, the procedures disregard hours which are identified as calm. The hour is treated as missing and a convention for handling missing hours is recommended.

9.3.4.2 Recommendations

a. Hourly concentrations calculated with steady-state Gaussian plume models using calms should not be considered valid; the wind and concentration estimates for these hours should be disregarded and considered to be missing. Critical concentrations for 3-, 8-, and 24-hour averages should be calculated by dividing the sum of the hourly concentrations for the period by the number of valid or non-missing hours. If the total number of valid hours is less than 18 for 24-hour averages, less than 6 for 8-hour averages or less than 3 for 3-hour averages, the total concentration should be divided by 18 for the 24-hour average, 6 for the 8-hour average and 3 for the 3-hour average. For annual averages, the sum of all valid hourly concentrations is divided by the number of non-calm hours during the year. For models listed in Appendix A, a post-processor computer program, CALMPRO[114] has been prepared, is available on the SCRAM Internet Web site (subsection 2.3), and should be used.

b. Stagnant conditions that include extended periods of calms often produce high concentrations over wide areas for relatively long averaging periods. The standard steady-state Gaussian plume models are often not applicable to such situations. When stagnation conditions are of concern, other modeling techniques should be considered on a case-by-case basis (see also subsection 8.2.8).

c. When used in steady-state Gaussian plume models, measured site specific wind speeds of less than 1 m/s but higher than the response threshold of the instrument should be input as 1 m/s; the corresponding wind direction should also be input. Wind observations below the response threshold of the instrument should be set to zero, with the input file in ASCII format. In all cases involving steady-state Gaussian plume models, calm hours should be treated as missing, and concentrations should be calculated as in paragraph (a) of this subsection.

10.0 Accuracy and Uncertainty of Models

10.1 Discussion

a. Increasing reliance has been placed on concentration estimates from models as the primary basis for regulatory decisions concerning source permits and emission control requirements. In many situations, such as review of a proposed source, no practical alternative exists. Therefore, there is an obvious need to know how accurate models really are and how any uncertainty in the estimates affects regulatory decisions. During the 1980's, attempts were made to encourage development of standardized evaluation methods.[16,115] EPA recognized the need for incorporating such information and has sponsored workshops[116] on model accuracy, the possible ways to quantify accuracy, and on considerations in the incorporation of model accuracy and uncertainty in the regulatory process. The Second (EPA) Conference on Air Quality Modeling, August 1982,[117] was devoted to that subject.

b. To better deduce the statistical significance of differences seen in model performance in the face of unaccounted for uncertainties and variations, investigators have more recently explored the use of bootstrap techniques.[118,119] Work is underway to develop a new generation of evaluation metrics[24] that takes into account the statistical differences (in error distributions) between model predictions and observations.[120] Even though the procedures and measures are still evolving to describe performance of models that characterize atmospheric fate, transport and diffusion[121,122,123] there has been general acceptance of a need to address the uncertainties inherent in atmospheric processes.

10.1.1 Overview of Model Uncertainty

a. Dispersion models generally attempt to estimate concentrations at specific sites that really represent an ensemble average of numerous repetitions of the same event.[24] The event is characterized by measured or "known" conditions that are input to the models, *e.g.*, wind speed, mixed layer height, surface heat flux, emission characteristics, etc. However, in addition to the known conditions, there are unmeasured or unknown variations in the conditions of this event, *e.g.*, unresolved details of the atmospheric flow such as the turbulent velocity field. These unknown conditions, may vary among repetitions of the event. As a result, deviations in observed concentrations from their ensemble average, and from the concentrations estimated by the model, are likely to occur even though the known conditions are fixed. Even with a *perfect model* that predicts the correct ensemble average, there are likely to be deviations from the observed concentrations in individual repetitions of the event, due to variations in the unknown conditions. The statistics of these concentration residuals are termed "inherent" uncertainty. Available evidence suggests that this source of uncertainty alone may be responsible for a typical range of variation in concentrations of as much as ±50 percent.[124]

b. Moreover, there is "reducible" uncertainty [115] associated with the model and its input conditions; neither models nor data bases are perfect. Reducible uncertainties are caused by: (1) Uncertainties in the input values of the known conditions (*i.e.*, emission characteristics and meteorological data); (2) errors in the measured concentrations which are used to compute the concentration residuals; and (3) inadequate model physics and formulation. The "reducible" uncertainties can be minimized through better (more accurate and more representative) measurements and better model physics.

c. To use the terminology correctly, reference to model accuracy should be limited to that portion of reducible uncertainty which deals with the physics and the formulation of the model. The accuracy of the model is normally determined by an evaluation procedure which involves the comparison of model concentration estimates with measured air quality data.[125] The statement of accuracy is based on statistical tests or performance measures such as bias, noise, correlation, etc.[16] However, information that allows a distinction between contributions of the various elements of inherent and reducible uncertainty is only now beginning to emerge.[24] As a result most discussions of the accuracy of models make no quantitative distinction between (1) limitations of the model versus (2) limitations of the data base and of knowledge concerning atmospheric variability. The reader should be aware that statements on model accuracy and uncertainty may imply the need for improvements in model performance that even the "perfect" model could not satisfy.

10.1.2 Studies of Model Accuracy

a. A number of studies[126,127] have been conducted to examine model accuracy, particularly with respect to the reliability of short-term concentrations required for ambient standard and increment evaluations. The results of these studies are not surprising. Basically, they confirm what expert atmospheric scientists have said for some time: (1) Models are more reliable for estimating longer time-averaged concentrations than for estimating short-term concentrations at specific locations; and (2) the models are reasonably reliable in estimating the magnitude of highest concentrations occurring sometime, somewhere within an area. For example, errors in highest estimated concentrations of ±10 to 40 percent are found to be typical [128,129], *i.e.*, certainly well within the often quoted factor-of-two accuracy that has long been recognized for these models. However, estimates of concentrations that occur at a specific time and site, are poorly correlated with actually observed concentrations and are much less reliable.

b. As noted above, poor correlations between paired concentrations at fixed stations may be due to "reducible" uncertainties in knowledge of the precise plume location and to unquantified inherent uncertainties. For example, Pasquill [130] estimates that, apart from data input errors, maximum ground-level concentrations at a given hour for a point source in flat terrain could be in error by 50 percent due to these uncertainties. Uncertainty of five to 10 degrees in the measured wind direction, which transports the plume, can result in concentration errors of 20 to 70 percent for a particular time and location, depending on stability and station location. Such uncertainties do not indicate that an estimated concentration does not occur, only that the precise time and locations are in doubt.

10.1.3 Use of Uncertainty in Decision-Making

a. The accuracy of model estimates varies with the model used, the type of application, and site specific characteristics. Thus, it is desirable to quantify the accuracy or uncertainty associated with concentration estimates used in decision-making. Communications between modelers and decision-makers must be fostered and further developed. Communications concerning concentration estimates currently exist in most cases, but the communications dealing with the accuracy of models and its meaning to the decision-maker are limited by the lack of a technical basis for quantifying and directly including uncertainty in decisions. Procedures for quantifying and interpreting uncertainty in the practical application of such concepts are only beginning to evolve; much study is still required.[115,116,117,131,132]

b. In all applications of models an effort is encouraged to identify the reliability of the model estimates for that particular area and to determine the magnitude and sources of error associated with the use of the model. The analyst is responsible for recognizing and quantifying limitations in the accuracy, precision and sensitivity of the procedure. Information that might be useful to the decision-maker in recognizing the seriousness of potential air quality violations includes such model accuracy estimates as accuracy of peak predictions, bias, noise, correlation, frequency distribution, spatial extent of high concentration, etc. Both space/time pairing of estimates and measurements and unpaired comparisons are recommended. Emphasis should be on the highest concentrations and the averaging times of the standards or increments of concern. Where possible, confidence intervals about the statistical values should be provided. However, while such information can be provided by the modeler to the decision-maker, it is unclear how this information should be used to make an air pollution control decision. Given a range of possible outcomes, it is easiest and tends to ensure consistency if the decision-maker confines his judgement to use of the "best estimate" provided by the modeler (*i.e.*, the design concentration estimated by a model recommended in the *Guideline* or an alternate model of known accuracy). This is an indication of the practical limitations imposed by current abilities of the technical community.

c. To improve the basis for decision-making, EPA has developed and is continuing to study procedures for determining the accuracy of models, quantifying the uncertainty, and expressing confidence levels in decisions that are made concerning emissions controls.[133,134] However, work in this area involves "breaking new ground" with slow and sporadic progress likely. As a result, it may be necessary to continue using the "best estimate" until sufficient technical progress has been made to meaningfully implement such concepts dealing with uncertainty.

10.1.4 Evaluation of Models

a. A number of actions have been taken to ensure that the best model is used correctly for each regulatory application and that a model is not arbitrarily imposed. First, the *Guideline* clearly recommends the most appropriate model be used in each case. Preferred models, based on a number of factors, are identified for many uses. General guidance on using alternatives to the preferred models is also provided. Second, the models have been subjected to a systematic performance evaluation and a peer scientific review. Statistical performance measures, including measures of difference (or residuals) such as bias, variance of difference and gross variability of the difference, and measures of correlation such as time, space, and time and space combined as recommended by the AMS Woods Hole Workshop [16], were generally followed. Third, more specific information has been provided for justifying the site specific use of alternative models in previously cited EPA guidance[22,25], and new models are under consideration and review.[24] Together these documents provide methods that allow a judgement to be made as to what models are most appropriate for a specific application. For the present, performance and the theoretical evaluation of models are being used as an indirect means to quantify one element of uncertainty in air pollution regulatory decisions.

b. EPA has participated in a series of conferences entitled, "Harmonisation within Atmospheric Dispersion Modelling for Regulatory Purposes."[135] for the purpose of promoting the development of improved methods for the characterization of model performance. There is a consensus developing on what should be considered in the evaluation of air quality models [136], namely quality assurance planning, documentation and scrutiny should be consistent with the intended use, and should include:

• Scientific peer review;
• Supportive analyses (diagnostic evaluations, code verification, sensitivity and uncertainty analyses);
• Diagnostic and performance evaluations with data obtained in trial locations, and
• Statistical performance evaluations in the circumstances of the intended applications.

Performance evaluations and diagnostic evaluations assess different qualities of how well a model is performing, and both are needed to establish credibility within the client and scientific community. Performance evaluations allow us to decide how well the model simulates the average temporal and spatial patterns seen in the observations, and employ large spatial/temporal scale data sets (*e.g.*, national data sets). Performance evaluations also allow determination of relative performance of a model in comparison with alternative modeling systems. Diagnostic evaluations allow determination of a model capability to simulate individual processes that affect the results, and usually employ smaller spatial/temporal scale date sets (*e.g.*, field studies). Diagnostic evaluations allow us to decide if we get the right answer for the right reason. The objective comparison of modeled concentrations with observed field data provides only a partial means for assessing model performance. Due to the limited supply of evaluation data sets, there are severe practical limits in assessing model performance. For this reason, the conclusions reached in the science peer reviews and the supportive analyses have particular relevance in deciding whether a model will be useful for its intended purposes.

c. To extend information from diagnostic and performance evaluations, sensitivity and uncertainty analyses are encouraged since they can provide additional information on the effect of inaccuracies in the data bases and on the uncertainty in model estimates. Sensitivity analyses can aid in determining the effect of inaccuracies of variations or uncertainties in the data bases on the range of likely concentrations. Uncertainty analyses can aid in determining the range of likely concentration values, resulting from uncertainties in the model inputs, the model formulations, and parameterizations. Such information may be used to determine source impact and to evaluate control strategies. Where possible, information from such sensitivity analyses should be made available to the decision-maker with an appropriate interpretation of the effect on the critical concentrations.

10.2 Recommendations

a. No specific guidance on the quantification of model uncertainty for use in decision-making is being given at this time. As procedures for considering uncertainty develop and become implementable, this guidance will be changed and expanded. For the present, continued use of the "best estimate" is acceptable; however, in specific circumstances for O_3, PM–2.5 and regional haze, additional information and/or procedures may be appropriate.[41,42]

11.0 Regulatory Application of Models

11.1 Discussion

a. Procedures with respect to the review and analysis of air quality modeling and data analyses in support of SIP revisions, PSD permitting or other regulatory requirements need a certain amount of standardization to ensure consistency in the depth and comprehensiveness of both the review and the analysis itself. This section recommends procedures that permit some degree of standardization while at the same time allowing the flexibility needed to assure the technically best analysis for each regulatory application.

b. Dispersion model estimates, especially with the support of measured air quality data, are the preferred basis for air quality demonstrations. Nevertheless, there are instances where the performance of recommended dispersion modeling techniques, by comparison with observed air quality data, may be shown to be less than acceptable. Also, there may be no recommended modeling procedure suitable for the situation. In these instances, emission limitations may be established solely on the basis of observed air quality data as would be applied to a modeling analysis. The same care should be given to the analyses of the air quality data as would be applied to a modeling analysis.

c. The current NAAQS for SO_2 and CO are both stated in terms of a concentration not to be exceeded more than once a year. There is only an annual standard for NO_2 and a quarterly standard for Pb. Standards for fine particulate matter (PM–2.5) are expressed in terms of both long-term (annual) and short-term (daily) averages. The long-term standard is calculated using the three year average of the annual averages while the short-term standard is calculated using the three year average of the 98th percentile of the daily average concentration. For PM–10, the convention is to compare the arithmetic mean, averaged over 3 consecutive years, with the concentration specified in the NAAQS (50 $\mu g/m^3$). The 24-hour NAAQS (150 $\mu g/m^3$) is met if, over a 3-year period, there is (on average) no more than one exceedance per year. For ozone the short term 1-hour standard is expressed in terms of an expected exceedance limit while the short term 8-hour standard is expressed in terms of a three year average of the annual fourth highest daily maximum 8-hour value. The NAAQS are subjected to extensive review and possible revision every 5 years.

d. This section discusses general requirements for concentration estimates and identifies the relationship to emission limits. The following recommendations apply to: (1) Revisions of State Implementation Plans and (2) the review of new sources and the prevention of significant deterioration (PSD).

11.2 Recommendations

11.2.1 Analysis Requirements

a. Every effort should be made by the Regional Office to meet with all parties involved in either a SIP revision or a PSD permit application prior to the start of any work on such a project. During this meeting, a protocol should be established between the preparing and reviewing parties to define the procedures to be followed, the data to be collected, the model to be used, and the analysis of the source and concentration data. An example of requirements for such an effort is contained in the Air Quality Analysis Checklist posted on EPA's Internet SCRAM Web site (subsection 2.3). This checklist suggests the level of detail required to assess the air quality resulting from the proposed action. Special cases may require additional data collection or analysis and this should be determined and agreed upon at this preapplication meeting. The protocol should be written and agreed upon by the parties concerned, although a formal legal document is not intended. Changes in such a protocol are often required as the data collection and analysis progresses. However, the protocol establishes a common understanding of the requirements.

b. An air quality analysis should begin with a screening model to determine the potential of the proposed source or control strategy to violate the PSD increment or NAAQS. For traditional stationary sources, EPA guidance[27] should be followed. Guidance is also available for mobile sources.[57]

c. If the concentration estimates from screening techniques indicate that the PSD increment or NAAQS may be approached or exceeded, then a more refined modeling analysis is appropriate and the model user should select a model according to recommendations in Sections 4–8. In some instances, no refined technique may be specified in this guide for the situation. The model user is then encouraged to submit a model developed specifically for the case at hand. If that is not possible, a screening technique may supply the needed results.

d. Regional Offices should require permit applicants to incorporate the pollutant contributions of all sources into their analysis. Where necessary this may include emissions associated with growth in the area of impact of the new or modified source. PSD air quality assessments should consider the amount of the allowable air quality increment that has already been consumed by other sources. Therefore, the most recent source applicant should model the existing or permitted sources in addition to the one currently under consideration. This would permit the use of newly acquired data or improved modeling techniques if such have become available since the last source was permitted. When remodeling, the worst case used in the previous modeling analysis should be one set of conditions modeled in the new analysis. All sources should be modeled for each set of meteorological conditions selected.

11.2.2 Use of Measured Data in Lieu of Model Estimates

a. Modeling is the preferred method for determining emission limitations for both new and existing sources. When a preferred model is available, model results alone (including background) are sufficient. Monitoring will normally not be accepted as the sole basis for emission limitation. In some instances when the modeling technique available is only a screening technique, the addition of air quality data to the analysis may lend credence to model results.

b. There are circumstances where there is no applicable model, and measured data may need to be used. However, only in the case of an existing source should monitoring data alone be a basis for emission limits. In addition, the following items (i–vi) should be considered prior to the acceptance of the measured data:

i. Does a monitoring network exist for the pollutants and averaging times of concern?

ii. Has the monitoring network been designed to locate points of maximum concentration?

iii. Do the monitoring network and the data reduction and storage procedures meet EPA monitoring and quality assurance requirements?

iv. Do the data set and the analysis allow impact of the most important individual sources to be identified if more than one source or emission point is involved?

v. Is at least one full year of valid ambient data available?

vi. Can it be demonstrated through the comparison of monitored data with model results that available models are not applicable?

c. The number of monitors required is a function of the problem being considered. The source configuration, terrain configuration, and meteorological variations all have an impact on number and placement of monitors. Decisions can only be made on a case-by-case basis. Guidance is available for establishing criteria for demonstrating that a model is not applicable.[22]

d. Sources should obtain approval from the appropriate reviewing authority (paragraph 3.0(b)) for the monitoring network prior to the start of monitoring. A monitoring protocol agreed to by all concerned parties is highly desirable. The design of the network, the number, type and location of the monitors, the sampling period, averaging time as well as the need for meteorological monitoring or the use of mobile sampling or plume tracking techniques, should all be specified in the protocol and agreed upon prior to start-up of the network.

11.2.3 Emission Limits

11.2.3.1 Design Concentrations

a. Emission limits should be based on concentration estimates for the averaging time that results in the most stringent control requirements. The concentration used in specifying emission limits is called the design value or design concentration and is a sum of the concentration contributed by the source and the background concentration.

b. To determine the averaging time for the design value, the most restrictive NAAQS should be identified by calculating, for each averaging time, the ratio of the difference between the applicable NAAQS (S) and the background concentration (B) to the (model) predicted concentration (P) (*i.e.*, (S–B)/P). The averaging time with the lowest ratio identifies the most restrictive standard. If the annual average is the most restrictive, the highest estimated annual average concentration from one or a number of years of data is the design value. When short term standards are most restrictive, it may be necessary to consider a broader range of concentrations than the highest value. For example, for pollutants such as SO_2, the highest, second-highest concentration is the design value. For pollutants with statistically based NAAQS, the design value is found by determining the more restrictive of: (1) The short-term concentration over the period specified in the standard, or (2) the long-term concentration that is not expected to exceed the long-term NAAQS. Determination of design values for PM–10 is presented in more detail in EPA guidance.[43]

11.2.3.2 NAAQS Analyses for New or Modified Sources

a. For new or modified sources predicted to have a significant ambient impact[91] and to be located in areas designated attainment or unclassifiable for the SO_2, Pb, NO_2, or CO NAAQS, the demonstration as to whether the source will cause or contribute to an air quality violation should be based on: (1) The highest estimated annual average concentration determined from annual averages of individual years; or (2) the highest, second-highest estimated concentration for averaging times of 24-hours or less; and (3) the significance of the spatial and temporal contribution to any modeled violation. For Pb, the highest estimated concentration based on an individual calendar quarter averaging period should be used. Background concentrations should be added to the estimated impact of the source. The most restrictive standard should be used in all cases to assess the threat of an air quality violation. For new or modified sources predicted to have a significant ambient impact[91] in areas designated attainment or unclassifiable for the PM–10 NAAQS, the demonstration of whether or not the source will cause or contribute to an air quality violation should be based on sufficient data to show whether: (1) The projected 24-hour average concentrations will exceed the 24-hour NAAQS more than 1 percent of the time, on average ; (2) the expected (*i.e.*, average) annual mean concentration will exceed the annual NAAQS; and (3) the source contributes significantly, in a temporal and spatial sense, to any modeled violation.

11.2.3.3 PSD Air Quality Increments and Impacts

a. The allowable PSD increments for criteria pollutants are established by regulation and cited in 40 CFR 51.166. These maximum allowable increases in pollutant concentrations may be exceeded once per year at each site, except for the annual increment that may not be exceeded. The highest, second-highest increase in estimated concentrations for the short term averages as determined by a model should be less than or equal to the permitted increment. The modeled annual averages should not exceed the increment.

b. Screening techniques defined in subsection 4.1 can sometimes be used to estimate short term incremental concentrations for the first new source that triggers the baseline in a given area. However, when multiple increment-consuming sources are involved in the calculation, the use of a refined model with at least 1 year of site specific or 5 years of (off-site) NWS data is normally required (subsection 9.3.1.2). In such cases, sequential modeling must demonstrate that the allowable increments are not exceeded temporally and spatially, *i.e.*, for all receptors for each time period throughout the year(s) (time period means the appropriate PSD averaging time, *e.g.*, 3-hour, 24-hour, etc.).

c. The PSD regulations require an estimation of the SO_2, particulate matter (PM–10), and NO_2 impact on any Class I area. Normally, steady-state Gaussian plume models should not be applied at distances greater than can be accommodated by the steady state assumptions inherent in such models. The maximum distance for refined steady-state Gaussian plume model application for regulatory purposes is generally considered to be 50km. Beyond the 50km range, screening techniques may be used to determine if more refined modeling is needed. If refined models are needed, long range transport models should be considered in accordance with subsection 7.2.3. As previously noted in Sections 3 and 7, the need to involve the Federal Land Manager in decisions on potential air quality impacts, particularly in relation to PSD Class I areas, cannot be overemphasized.

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Appendix A to Appendix W of Part 51—Summaries of Preferred Air Quality Models

Table of Contents

A.0 Introduction and Availability

(1) This appendix summarizes key features of refined air quality models preferred for specific regulatory applications. For each model, information is provided on availability, approximate cost (where applicable), regulatory use, data input, output format and options, simulation of atmospheric physics, and accuracy. These models may be used without a formal demonstration of applicability provided they satisfy the recommendations for regulatory use; not all options in the models are necessarily recommended for regulatory use.

(2) Many of these models have been subjected to a performance evaluation using comparisons with observed air quality data. Where possible, several of the models contained herein have been subjected to evaluation exercises, including (1) statistical performance tests recommended by the American Meteorological Society and (2) peer scientific reviews. The models in this appendix have been selected on the basis of the results of the model evaluations, experience with previous use, familiarity of the model to various air quality programs, and the costs and resource requirements for use.

(3) With the exception of EDMS, codes and documentation for all models listed in this appendix are available from EPA's Support Center for Regulatory Air Models (SCRAM) Web site at *http://www.epa.gov/scram001*. Documentation is also available from the National Technical Information Service (NTIS), *http://www.ntis.gov* or U.S. Department of Commerce, Springfield, VA 22161; phone: (800) 553–6847. Where possible, accession numbers are provided.

A.1 Buoyant Line and Point Source Dispersion Model (BLP)

Reference

Schulman, Lloyd L. and Joseph S. Scire, 1980. Buoyant Line and Point Source (BLP) Dispersion Model User's Guide. Document P–7304B. Environmental Research and Technology, Inc., Concord, MA. (NTIS No. PB 81–164642)

Availability

The computer code is available on EPA's Internet SCRAM website and also on diskette (as PB 2002–500051) from the National Technical Information Service (see Section A.0).

Abstract

BLP is a Gaussian plume dispersion model designed to handle unique modeling problems associated with aluminum reduction plants, and other industrial sources where plume rise and downwash effects from stationary line sources are important.

a. Recommendations for Regulatory Use

(1) The BLP model is appropriate for the following applications:

• Aluminum reduction plants which contain buoyant, elevated line sources;
• Rural areas;
• Transport distances less than 50 kilometers;
• Simple terrain; and
• One hour to one year averaging times.

(2) The following options should be selected for regulatory applications:

(i) Rural (IRU=1) mixing height option;
(ii) Default (no selection) for plume rise wind shear (LSHEAR), transitional point source plume rise (LTRANS), vertical potential temperature gradient (DTHTA), vertical wind speed power law profile exponents (PEXP), maximum variation in number of stability classes per hour (IDELS), pollutant decay (DECFAC), the constant in Briggs' stable plume rise equation (CONST2), constant in Briggs' neutral plume rise equation (CONST3), convergence criterion for the line source calculations (CRIT), and maximum iterations allowed for line source calculations (MAXIT); and
(iii) Terrain option (TERAN) set equal to 0.0, 0.0, 0.0, 0.0, 0.0, 0.0

(3) For other applications, BLP can be used if it can be demonstrated to give the same estimates as a recommended model for the same application, and will subsequently be executed in that mode.

(4) BLP can be used on a case-by-case basis with specific options not available in a recommended model if it can be demonstrated, using the criteria in Section 3.2, that the model is more appropriate for a specific application.

b. Input Requirements

(1) Source data: point sources require stack location, elevation of stack base, physical stack height, stack inside diameter, stack gas exit velocity, stack gas exit temperature, and pollutant emission rate. Line sources require coordinates of the end points of the line, release height, emission rate, average line source width, average building width, average spacing between buildings, and average line source buoyancy parameter.

(2) Meteorological data: Hourly surface weather data from punched cards or from the preprocessor program PCRAMMET which provides hourly stability class, wind direction, wind speed, temperature, and mixing height.

(3) Receptor data: Locations and elevations of receptors, or location and size of receptor grid or request automatically generated receptor grid.

c. Output

(1) Printed output (from a separate post-processor program) includes:

(2) Total concentration or, optionally, source contribution analysis; monthly and annual frequency distributions for 1-, 3-, and 24-hour average concentrations; tables of 1-, 3-, and 24-hour average concentrations at each receptor; table of the annual (or length of run) average concentrations at each receptor;

(3) Five highest 1-, 3-, and 24-hour average concentrations at each receptor; and

(4) Fifty highest 1-, 3-, and 24-hour concentrations over the receptor field.

d. Type of Model

BLP is a gaussian plume model.

e. Pollutant Types

BLP may be used to model primary pollutants. This model does not treat settling and deposition.

f. Source-Receptor Relationship

(1) BLP treats up to 50 point sources, 10 parallel line sources, and 100 receptors arbitrarily located.

(2) User-input topographic elevation is applied for each stack and each receptor.

g. Plume Behavior

(1) BLP uses plume rise formulas of Schulman and Scire (1980).

(2) Vertical potential temperature gradients of 0.02 Kelvin per meter for E stability and 0.035 Kelvin per meter are used for stable plume rise calculations. An option for user input values is included.

(3) Transitional rise is used for line sources.

(4) Option to suppress the use of transitional plume rise for point sources is included.

(5) The building downwash algorithm of Schulman and Scire (1980) is used.

h. Horizontal Winds

(1) Constant, uniform (steady-state) wind is assumed for an hour.

Straight line plume transport is assumed to all downwind distances.

(2) Wind speeds profile exponents of 0.10, 0.15, 0.20, 0.25, 0.30, and 0.30 are used for stability classes A through F, respectively. An option for user—defined values and an option to suppress the use of the wind speed profile feature are included.

i. Vertical Wind Speed

Vertical wind speed is assumed equal to zero.

j. Horizontal Dispersion

(1) Rural dispersion coefficients are from Turner (1969), with no adjustment made for variations in surface roughness or averaging time.

(2) Six stability classes are used.

k. Vertical Dispersion

(1) Rural dispersion coefficients are from Turner (1969), with no adjustment made for variations in surface roughness.

(2) Six stability classes are used.

(3) Mixing height is accounted for with multiple reflections until the vertical plume standard deviation equals 1.6 times the mixing height; uniform mixing is assumed beyond that point.

(4) Perfect reflection at the ground is assumed.

l. Chemical Transformation

Chemical transformations are treated using linear decay. Decay rate is input by the user.

m. Physical Removal

Physical removal is not explicitly treated.

n. Evaluation Studies

Schulman, L.L. and J.S. Scire, 1980. Buoyant Line and Point Source (BLP) Dispersion Model User's Guide, P–7304B. Environmental Research and Technology, Inc., Concord, MA.

Scire, J.S. and L.L. Schulman, 1981. Evaluation of the BLP and ISC Models with SF_6 Tracer Data and SO_2 Measurements at Aluminum Reduction Plants. APCA Specialty Conference on Dispersion Modeling for Complex Sources, St. Louis, MO.

A.2 CALINE3

Reference

Benson, Paul E, 1979. CALINE3—A Versatile Dispersion Model for Predicting Air Pollutant Levels Near Highways and Arterial Streets. Interim Report, Report Number FHWA/CA/TL–79/23. Federal Highway Administration, Washington, DC. (NTIS No. PB 80–220841)

Availability

The CALINE3 model is available on diskette (as PB 95–502712) from NTIS. The source code and user's guide are also available on EPA's Internet SCRAM Web site (Section A.0).

Abstract

CALINE3 can be used to estimate the concentrations of nonreactive pollutants from highway traffic. This steady-state Gaussian model can be applied to determine air pollution concentrations at receptor locations downwind of "at-grade," "fill," "bridge," and "cut section" highways located in relatively uncomplicated terrain. The model is applicable for any wind direction, highway orientation, and receptor location. The model has adjustments for averaging time and surface roughness, and can handle up to 20 links and 20 receptors. It also contains an algorithm for deposition and settling velocity so that particulate concentrations can be predicted.

a. Recommendations for Regulatory Use

CALINE–3 is appropriate for the following applications:

- Highway (line) sources;
- Urban or rural areas;
- Simple terrain;
- Transport distances less than 50 kilometers; and
- One-hour to 24-hour averaging times.

b. Input Requirements

(1) Source data: Up to 20 highway links classed as "at-grade," "fill" "bridge," or "depressed"; coordinates of link end points; traffic volume; emission factor; source height; and mixing zone width.

(2) Meteorological data: Wind speed, wind angle (measured in degrees clockwise from the Y axis), stability class, mixing height, ambient (background to the highway) concentration of pollutant.

(3) Receptor data: Coordinates and height above ground for each receptor.

c. Output

Printed output includes concentration at each receptor for the specified meteorological condition.

d. Type of Model

CALINE–3 is a Gaussian plume model.

e. Pollutant Types

CALINE–3 may be used to model primary pollutants.

f. Source-Receptor Relationship

(1) Up to 20 highway links are treated.

(2) CALINE–3 applies user input location and emission rate for each link. User-input receptor locations are applied.

g. Plume Behavior

Plume rise is not treated.

h. Horizontal Winds

(1) User-input hourly wind speed and direction are applied.

(2) Constant, uniform (steady-state) wind is assumed for an hour.

i. Vertical Wind Speed

Vertical wind speed is assumed equal to zero.

j. Horizontal Dispersion

(1) Six stability classes are used.

(2) Rural dispersion coefficients from Turner (1969) are used, with adjustment for roughness length and averaging time.

(3) Initial traffic-induced dispersion is handled implicitly by plume size parameters.

k. Vertical Dispersion

(1) Six stability classes are used.

(2) Empirical dispersion coefficients from Benson (1979) are used including an adjustment for roughness length.

(3) Initial traffic-induced dispersion is handled implicitly by plume size parameters.

(4) Adjustment for averaging time is included.

l. Chemical Transformation

Not treated.

m. Physical Removal

Optional deposition calculations are included.

n. Evaluation Studies

Bemis, G.R. *et al.*, 1977. Air Pollution and Roadway Location, Design, and Operation—Project Overview. FHWA–CA–TL–7080–77–25, Federal Highway Administration, Washington, D.C.

Cadle, S.H. *et al.*, 1976. Results of the General Motors Sulfate Dispersion Experiment, GMR–2107. General Motors Research Laboratories, Warren, MI.

Dabberdt, W.F., 1975. Studies of Air Quality on and Near Highways, Project 2761. Stanford Research Institute, Menlo Park, CA.

A.3 CALPUFF

References

Scire, J.S., D.G. Strimaitis and R.J. Yamartino, 2000. A User's Guide for the CALPUFF Dispersion Model (Version 5.0). Earth Tech, Inc., Concord, MA.

Scire J.S., F.R. Robe, M.E. Fernau and R.J. Yamartino, 2000. A User's Guide for the CALMET Meteorological Model (Version 5.0). Earth Tech, Inc., Concord, MA.

Availability

The model code and its documentation are available at no cost for download from the model developers' Internet Web site: *http://www.src.com/calpuff/calpuff1.htm*. You may also contact Joseph Scire, Earth Tech, Inc., 196 Baker Avenue, Concord, MA 01742; Telephone: (978) 371–4200, Fax: (978) 371–2468, e-mail: *jss@src.com*.

Abstract

CALPUFF is a multi-layer, multi-species non-steady-state puff dispersion modeling system that simulates the effects of time- and space-varying meteorological conditions on pollutant transport, transformation, and removal. CALPUFF is intended for use on scales from tens of meters from a source to hundreds of kilometers. It includes algorithms for near-field effects such as building downwash, transitional buoyant and momentum plume rise, partial plume penetration, subgrid scale terrain and coastal interactions effects, and terrain impingement as well as longer range effects such as pollutant removal due to wet scavenging and dry deposition, chemical transformation, vertical wind shear, overwater transport, plume fumigation, and visibility effects of particulate matter concentrations.

a. Recommendations for Regulatory Use

(1) CALPUFF is appropriate for long range transport (source-receptor distances of 50 to several hundred kilometers) of emissions from point, volume, area, and line sources. The meteorological input data should be fully characterized with time-and-space-varying three dimensional wind and meteorological conditions using CALMET, as discussed in paragraphs 9.3(c) and 9.3.1.2(d) of Appendix W.

(2) CALPUFF may also be used on a case-by-case basis if it can be demonstrated using the criteria in Section 3.2 that the model is more appropriate for the specific application. The purpose of choosing a modeling system like CALPUFF is to fully treat stagnation, wind reversals, and time and space variations of meteorology effects on transport and dispersion, as discussed in paragraph 8.2.8(a).

(3) For regulatory applications of CALMET and CALPUFF, the regulatory default option should be used. Inevitably, some of the model control options will have to be set specific for the application using expert judgement and in consultation with the relevant reviewing authorities.

b. Input Requirements

Source Data:

1. Point sources: Source location, stack height, diameter, exit velocity, exit temperature, base elevation, wind direction specific building dimensions (for building downwash calculations), and emission rates for each pollutant. Particle size distributions may be entered for particulate matter. Temporal emission factors (diurnal cycle, monthly cycle, hour/season, wind speed/ stability class, or temperature-dependent

emission factors) may also be entered. Arbitrarily-varying point source parameters may be entered from an external file.

2. Area sources: Source location and shape, release height, base elevation, initial vertical distribution (σ_z) and emission rates for each pollutant. Particle size distributions may be entered for particulate matter. Temporal emission factors (diurnal cycle, monthly cycle, hour/season, wind speed/stability class, or temperature-dependent emission factors) may also be entered. Arbitrarily-varying area source parameters may be entered from an external file. Area sources specified in the external file are allowed to be buoyant and their location, size, shape, and other source characteristics are allowed to change in time.

3. Volume sources: Source location, release height, base elevation, initial horizontal and vertical distributions (σ_y, σ_z) and emission rates for each pollutant. Particle size distributions may be entered for particulate matter. Temporal emission factors (diurnal cycle, monthly cycle, hour/season, wind speed/stability class, or temperature-dependent emission factors) may also be entered. Arbitrarily-varying volume source parameters may be entered from an external file. Volume sources with buoyancy can be simulated by treating the source as a point source and entering initial plume size parameters—initial (σ_y, σ_z)—to define the initial size of the volume source.

4. Line sources: Source location, release height, base elevation, average buoyancy parameter, and emission rates for each pollutant. Building data may be entered for line source emissions experiencing building downwash effects. Particle size distributions may be entered for particulate matter. Temporal emission factors (diurnal cycle, monthly cycle, hour/season, wind speed/stability class, or temperature-dependent emission factors) may also be entered. Arbitrarily-varying line source parameters may be entered from an external file.

Meteorological Data (different forms of meteorological input can be used by CALPUFF):

1. Time-dependent three-dimensional meteorological fields generated by CALMET. This is the preferred mode for running CALPUFF. Inputs into CALMET include surface observations of wind speed, wind direction, temperature, cloud cover, ceiling height, relative humidity, surface pressure, and precipitation (type and amount), and upper air sounding data (wind speed, wind direction, temperature, and height). Optional large-scale model output (*e.g.*, from MM5) can be used by CALMET as well (paragraph 9.3.1.2(d)).

2. Single station surface and upper air meteorological data in CTDMPLUS data file formats (SURFACE.DAT and PROFILE.DAT files). This allows a vertical variation in the meteorological parameters but no spatial variability.

3. Single station meteorological data in ISCST3 data file format. This option does not account for variability of the meteorological parameters in the horizontal or vertical, except as provided for by the use of stability-dependent wind shear exponents and average temperature lapse rates.

Gridded terrain and land use data are required as input into CALMET when Option 1 is used. Geophysical processor programs are provided that interface the modeling system to standard terrain and land use data bases provided by the U.S. Geological Survey (USGS).

Receptor Data:

CALPUFF includes options for gridded and non-gridded (discrete) receptors. Special subgrid-scale receptors are used with the subgrid-scale complex terrain option. An option is provided for discrete receptors to be placed at ground-level or above the local ground level (*i.e.*, flagpole receptors). Gridded and subgrid-scale receptors are placed at the local ground level only.

Other Input:

CALPUFF accepts hourly observations of ozone concentrations for use in its chemical transformation algorithm. Subgrid-scale coastlines can be specified in its coastal boundary file. Optional, user-specified deposition velocities and chemical transformation rates can also be entered. CALPUFF accepts the CTDMPLUS terrain and receptor files for use in its subgrid-scale terrain algorithm. Inflow boundary conditions of modeled pollutants can be specified in a boundary condition file.

c. Output

CALPUFF produces files of hourly concentrations of ambient concentrations for each modeled species, wet deposition fluxes, dry deposition fluxes, and for visibility applications, extinction coefficients. Postprocessing programs (PRTMET and CALPOST) provide options for analysis and display of the modeling results.

d. Type of Model

(1) CALPUFF is a non-steady-state time-and space-dependent Gaussian puff model. CALPUFF includes parameterized gas phase chemical transformation of SO_2, $SO_4^{=}$, NO, NO_2, HNO_3, NO_3^-, and organic aerosols. CALPUFF can treat primary pollutants such as PM–10, toxic pollutants, ammonia, and other passive pollutants. The model includes a resistance-based dry deposition model for both gaseous pollutants and particulate matter. Wet deposition is treated using a scavenging coefficient approach. The model has detailed parameterizations of complex terrain effects, including terrain impingement, side-wall scrapping, and steep-walled terrain influences on lateral plume growth. A subgrid-scale complex terrain module based on a dividing streamline concept divides the flow into a lift component traveling over the obstacle and a wrap component deflected around the obstacle.

(2) The meteorological fields used by CALPUFF are produced by the CALMET meteorological model. CALMET includes a diagnostic wind field model containing objective analysis and parameterized treatments of slope flows, valley flows, terrain blocking effects, and kinematic terrain effects, lake and sea breeze circulations, and a divergence minimization procedure. An energy-balance scheme is used to compute sensible and latent heat fluxes and turbulence parameters over land surfaces. A profile method is used over water. CALMET contains interfaces to prognostic meteorological models such as the Penn State/NCAR Mesoscale Model (*e.g.*, MM5; Section 13.0, ref. 94), as well as the RAMS and Eta models.

e. Pollutant Types

CALPUFF may be used to model gaseous pollutants or particulate matter that are inert or undergo linear chemical reactions, such as SO_2, $SO_4^{=}$, NO, NO_2, HNO_3, NO_3^-, NH_3, PM–10, and toxic pollutants. For regional haze analyses, sulfate and nitrate particulate components are explicitly treated.

f. Source-Receptor Relationships

CALPUFF contains no fundamental limitations on the number of sources or receptors. Parameter files are provided that allow the user to specify the maximum number of sources, receptors, puffs, species, grid cells, vertical layers, and other model parameters. Its algorithms are designed to be suitable for source-receptor distances from tens of meters to hundreds of kilometers.

g. Plume Behavior

Momentum and buoyant plume rise is treated according to the plume rise equations of Briggs (1974, 1975) for non-downwashing point sources, Schulman and Scire (1980) for line sources and point sources subject to building downwash effects, and Zhang (1993) for buoyant area sources. Stack tip downwash effects and partial plume penetration into elevated temperature inversions are included.

h. Horizontal Winds

A three-dimensional wind field is computed by the CALMET meteorological model. CALMET combines an objective analysis procedure using wind observations with parameterized treatments of slope flows, valley flows, terrain kinematic effects, terrain blocking effects, and sea/lake breeze circulations. CALPUFF may optionally use single station (horizontally-constant) wind fields in the CTDMPLUS data format.

i. Vertical Wind Speed

Vertical wind speeds are not used explicitly by CALPUFF. Vertical winds are used in the development of the horizontal wind components by CALMET.

j. Horizontal Dispersion

Turbulence-based dispersion coefficients provide estimates of horizontal plume dispersion based on measured or computed values of σ_v. The effects of building downwash and buoyancy-induced dispersion are included. The effects of vertical wind shear are included through the puff splitting algorithm. Options are provided to use Pasquill-Gifford (rural) and McElroy-Pooler (urban) dispersion coefficients. Initial plume size from area or volume sources is allowed.

k. Vertical Dispersion

Turbulence-based dispersion coefficients provide estimates of vertical plume dispersion based on measured or computed values of σ_w. The effects of building downwash and buoyancy-induced dispersion are included. Vertical dispersion during convective conditions is simulated with a probability density function (pdf) model based on Weil *et al.* (1997). Options are provided to use Pasquill-Gifford (rural) and McElroy-Pooler (urban) dispersion coefficients. Initial plume size from area or volume sources is allowed.

l. Chemical Transformation

Gas phase chemical transformations are treated using parameterized models of SO_2 conversion to $SO_4^=$ and NO conversion to NO_2, HNO_3, and $SO_4^=$. Organic aerosol formation is treated.

m. Physical Removal

Dry deposition of gaseous pollutants and particulate matter is parameterized in terms of a resistance-based deposition model. Gravitational settling, inertial impaction, and Brownian motion effects on deposition of particulate matter is included. Wet deposition of gases and particulate matter is parameterized in terms of a scavenging coefficient approach.

n. Evaluation Studies

Berman, S., J.Y. Ku, J. Zhang and S.T. Rao, 1977: Uncertainties in estimating the mixing depth—Comparing three mixing depth models with profiler measurements, *Atmospheric Environment*, 31: 3023–3039.

Environmental Protection Agency, 1998. Interagency Workgroup on Air Quality Modeling (IWAQM) Phase 2 Summary Report and Recommendations for Modeling Long-Range Transport Impacts. EPA Publication No. EPA–454/R–98–019. Office of Air Quality Planning & Standards, Research Triangle Park, NC.

Irwin, J.S. 1997. A Comparison of CALPUFF Modeling Results with 1997 INEL Field Data Results. In *Air Pollution Modeling and its Application, XII*. Edited by S.E. Gyrning and N. Chaumerliac. Plenum Press, New York, NY.

Irwin, J.S., J.S. Scire and D.G. Strimaitis, 1998. A Comparison of CALPUFF Modeling Results with CAPTEX Field Data Results. In *Air Pollution Modeling and its Application, XI*. Edited by S.E. Gyrning and F.A. Schiermeier. Plenum Press, New York, NY.

Strimaitis, D.G., J.S. Scire and J.C. Chang. 1998. Evaluation of the CALPUFF Dispersion Model with Two Power Plant Data Sets. Tenth Joint Conference on the Application of Air Pollution Meteorology, Phoenix, Arizona. American Meteorological Society, Boston, MA. January 11–16, 1998.

A.4 Complex Terrain Dispersion Model Plus Algorithms for Unstable Situations (CTDMPLUS)

Reference

Perry, S.G., D.J. Burns, L.H. Adams, R.J. Paine, M.G. Dennis, M.T. Mills, D.G. Strimaitis, R.J. Yamartino and E.M. Insley, 1989. User's Guide to the Complex Terrain Dispersion Model Plus Algorithms for Unstable Situations (CTDMPLUS). Volume 1: Model Descriptions and User Instructions. EPA Publication No. EPA–600/8–89–041. Environmental Protection Agency, Research Triangle Park, NC. (NTIS No. PB 89–181424)

Perry, S.G., 1992. CTDMPLUS: A Dispersion Model for Sources near Complex Topography. Part I: Technical Formulations. *Journal of Applied Meteorology*, 31(7): 633–645.

Availability

This model code is available on EPA's Internet SCRAM Web site and also on diskette (as PB 90–504119) from the National Technical Information Service (Section A.0).

Abstract

CTDMPLUS is a refined point source Gaussian air quality model for use in all stability conditions for complex terrain applications. The model contains, in its entirety, the technology of CTDM for stable and neutral conditions. However, CTDMPLUS can also simulate daytime, unstable conditions, and has a number of additional capabilities for improved user friendliness. Its use of meteorological data and terrain information is different from other EPA models; considerable detail for both types of input data is required and is supplied by preprocessors specifically designed for CTDMPLUS. CTDMPLUS requires the parameterization of individual hill shapes using the terrain preprocessor and the association of each model receptor with a particular hill.

a. Recommendation for Regulatory Use

CTDMPLUS is appropriate for the following applications:

- Elevated point sources;
- Terrain elevations above stack top;
- Rural or urban areas;
- Transport distances less than 50 kilometers; and
- One hour to annual averaging times when used with a post-processor program such as CHAVG.

b. Input Requirements

(1) Source data: For each source, user supplies source location, height, stack diameter, stack exit velocity, stack exit temperature, and emission rate; if variable emissions are appropriate, the user supplies hourly values for emission rate, stack exit velocity, and stack exit temperature.

(2) Meteorological data: For applications of CTDMPLUS, multiple level (typically three or more) measurements of wind speed and direction, temperature and turbulence (wind fluctuation statistics) are required to create the basic meteorological data file ("PROFILE"). Such measurements should be obtained up to the representative plume height(s) of interest (*i.e.*, the plume height(s) under those conditions important to the determination of the design concentration). The representative plume height(s) of interest should be determined using an appropriate complex terrain screening procedure (*e.g.*, CTSCREEN) and should be documented in the monitoring/modeling protocol. The necessary meteorological measurements should be obtained from an appropriately sited meteorological tower augmented by SODAR and/or RASS if the representative plume height(s) of interest is above the levels represented by the tower measurements. Meteorological preprocessors then create a SURFACE data file (hourly values of mixed layer heights, surface friction velocity, Monin-Obukhov length and surface roughness length) and a RAWINsonde data file (upper air measurements of pressure, temperature, wind direction, and wind speed).

(3) Receptor data: Receptor names (up to 400) and coordinates, and hill number (each receptor must have a hill number assigned).

(4) Terrain data: User inputs digitized contour information to the terrain preprocessor which creates the TERRAIN data file (for up to 25 hills).

c. Output

(1) When CTDMPLUS is run, it produces a concentration file, in either binary or text format (user's choice), and a list file containing a verification of model inputs, *i.e.*,

- Input meteorological data from "SURFACE" and "PROFILE"
- Stack data for each source
- Terrain information
- Receptor information
- Source-receptor location (line printer map).

(2) In addition, if the case-study option is selected, the listing includes:

- Meteorological variables at plume height
- Geometrical relationships between the source and the hill
- Plume characteristics at each receptor, *i.e.*,

—Distance in along-flow and cross flow direction
—Effective plume-receptor height difference
—Effective σ_y σ_z values, both flat terrain and hill induced (the difference shows the effect of the hill)
—Concentration components due to WRAP, LIFT and FLAT.

(3) If the user selects the TOPN option, a summary table of the top 4 concentrations at each receptor is given. If the ISOR option is selected, a source contribution table for every hour will be printed.

(4) A separate disk file of predicted (1-hour only) concentrations ("CONC") is written if the user chooses this option. Three forms of output are possible:

(i) A binary file of concentrations, one value for each receptor in the hourly sequence as run;

(ii) A text file of concentrations, one value for each receptor in the hourly sequence as run; or

(iii) A text file as described above, but with a listing of receptor information (names, positions, hill number) at the beginning of the file.

(3) Hourly information provided to these files besides the concentrations themselves includes the year, month, day, and hour information as well as the receptor number with the highest concentration.

d. Type of Model

CTDMPLUS is a refined steady-state, point source plume model for use in all stability conditions for complex terrain applications.

e. Pollutant Types

CTDMPLUS may be used to model non-reactive, primary pollutants.

f. Source-Receptor Relationship

Up to 40 point sources, 400 receptors and 25 hills may be used. Receptors and sources are allowed at any location. Hill slopes are assumed not to exceed 15°, so that the linearized equation of motion for Boussinesq flow are applicable. Receptors upwind of the impingement point, or those associated with any of the hills in the modeling domain, require separate treatment.

g. Plume Behavior

(1) As in CTDM, the basic plume rise algorithms are based on Briggs' (1975) recommendations.

(2) A central feature of CTDMPLUS for neutral/stable conditions is its use of a critical dividing-streamline height (H_c) to separate the flow in the vicinity of a hill into two separate layers. The plume component in the upper layer has sufficient kinetic energy to pass over the top of the hill while streamlines in the lower portion are constrained to flow in a horizontal plane around the hill. Two separate components of CTDMPLUS compute ground-level concentrations resulting from plume material in each of these flows.

(3) The model calculates on an hourly (or appropriate steady averaging period) basis how the plume trajectory (and, in stable/neutral conditions, the shape) is deformed by each hill. Hourly profiles of wind and temperature measurements are used by CTDMPLUS to compute plume rise, plume penetration (a formulation is included to handle penetration into elevated stable layers, based on Briggs (1984)), convective scaling parameters, the value of H_c, and the Froude number above H_c.

h. Horizontal Winds

CTDMPLUS does not simulate calm meteorological conditions. Both scalar and vector wind speed observations can be read by the model. If vector wind speed is unavailable, it is calculated from the scalar wind speed. The assignment of wind speed (either vector or scalar) at plume height is done by either:

• Interpolating between observations above and below the plume height, or

• Extrapolating (within the surface layer) from the nearest measurement height to the plume height.

i. Vertical Wind Speed

Vertical flow is treated for the plume component above the critical dividing streamline height (H_c); see "Plume Behavior".

j. Horizontal Dispersion

Horizontal dispersion for stable/neutral conditions is related to the turbulence velocity scale for lateral fluctuations, σ_v, for which a minimum value of 0.2 m/s is used. Convective scaling formulations are used to estimate horizontal dispersion for unstable conditions.

k. Vertical Dispersion

Direct estimates of vertical dispersion for stable/neutral conditions are based on observed vertical turbulence intensity, *e.g.*, σ_w (standard deviation of the vertical velocity fluctuation). In simulating unstable (convective) conditions, CTDMPLUS relies on a skewed, bi-Gaussian probability density function (pdf) description of the vertical velocities to estimate the vertical distribution of pollutant concentration.

l. Chemical Transformation

Chemical transformation is not treated by CTDMPLUS.

m. Physical Removal

Physical removal is not treated by CTDMPLUS (complete reflection at the ground/hill surface is assumed).

n. Evaluation Studies

Burns, D.J., L.H. Adams and S.G. Perry, 1990. Testing and Evaluation of the CTDMPLUS Dispersion Model: Daytime Convective Conditions. Environmental Protection Agency, Research Triangle Park, NC.

Paumier, J.O., S.G. Perry and D.J. Burns, 1990. An Analysis of CTDMPLUS Model Predictions with the Lovett Power Plant Data Base. Environmental Protection Agency, Research Triangle Park, NC.

Paumier, J.O., S.G. Perry and D.J. Burns, 1992. CTDMPLUS: A Dispersion Model for Sources near Complex Topography. Part II: Performance Characteristics. *Journal of Applied Meteorology*, 31(7): 646–660.

A.6 Emissions and Dispersion Modeling System (EDMS) 3.1

Reference

Benson, Paul E., 1979. CALINE3—A Versatile Dispersion Model for Predicting Air Pollutant Levels Near Highways and Arterial Streets. Interim Report, Report Number FHWA/CA/TL–79/23. Federal Highway Administration, Washington, DC. (NTIS No. PB 80–220841)

Federal Aviation Administration, 1997. Emissions and Dispersion Modeling System (EDMS) Reference Manual. FAA Report No. FAA–AEE–97–01, USAF Report No. AL/EQ–TR–1997–0010, Federal Aviation Administration, Washington, DC 20591. SEE Availability below. (Note: this manual includes supplements that are available on the EDMS Internet Web site: *http://www.aee.faa.gov/aee-100/aee-120/edms/banner.htm*)

Petersen, W.B. and E.D. Rumsey, 1987. User's Guide for PAL 2.0—A Gaussian-Plume Algorithm for Point, Area, and Line Sources. EPA Publication No. EPA–600/8–87–009. Office of Research and Development, Research Triangle Park, NC. (NTIS No. PB 87–168 787/AS)

Availability

EDMS is available for $45 ($55 for users outside of the United States). The order form is available from: *http://www.aee.faa.gov.* Click the EDMS button on the left side of the page, and then click on the "EDMS Order Form" link. The $45 cost covers the distribution of the EDMS package: A CD ROM containing the executable installation file, the user manual, and the model changes document. This EDMS package does not include the source code, which is available only through special request and FAA approval. Upon installation the user will have on their computer an executable file for the model and supporting data and program files. Official contact at Federal Aviation Administration: Ms. Julie Draper, AEE, 800 Independence Avenue, SW., Washington, DC 20591, Phone: (202) 267–3494.

Abstract

EDMS is a combined emissions/dispersion model for assessing pollution at civilian airports and military air bases. This model, which was jointly developed by the Federal Aviation Administration (FAA) and the United States Air Force (USAF), produces an emission inventory of all airport sources and calculates concentrations produced by these sources at specified receptors. The system stores emission factors for fixed sources such as fuel storage tanks and incinerators and also for mobile sources such as aircraft or automobiles. The EDMS emissions inventory module incorporates methodologies described in AP–42 for calculating aircraft emissions, on-road and off-road vehicle emissions, and stationary source emissions. The dispersion modeling module incorporates PAL2 and CALINE3 (Section A.3) for the various emission source types. Both of these components interact with the database to retrieve and store data. The dispersion module, which processes point, area, and line sources, also incorporates a special meteorological preprocessor for processing up to one year of National Climatic Data Center (NCDC) hourly data.

a. Recommendations for Regulatory Use

EDMS is appropriate for the following applications:

• Cumulative effect of changes in aircraft operations, point source and mobile source emissions at airports or air bases;

• Simple terrain;

• Non-reactive pollutants;

• Transport distances less than 50 kilometers; and

• 1-hour to annual averaging times.

b. Input Requirements

(1) All data are entered through the EDMS graphical user interface. Typical entry items are annual and hourly source activity, source and receptor coordinates, etc. Some point sources, such as heating plants, require stack height, stack diameter, and effluent temperature inputs.

(2) Wind speed, wind direction, hourly temperature, and Pasquill-Gifford stability category (P–G) are the meteorological inputs. They can be entered manually through the EDMS data entry screens or automatically through the processing of previously loaded NCDC hourly data.

c. Output

Printed outputs consist of:

• A summary emission inventory report with pollutant totals by source category and detailed emission inventory reports for each source category; and

• A concentration summary report for up to 8760 hours (one year) of meteorological data that lists the number of sources, receptors, and the five highest concentrations for applicable averaging periods for the respective primary NAAQS.

d. Type of Model

For its emissions inventory calculations, EDMS uses algorithms consistent with the EPA Compilation of Air Pollutant Emission Factors, AP–42 (Section 11.0, ref. 96). For its dispersion calculations, EDMS uses the Point Area & Line (PAL2) model and the CALifornia LINE source (CALINE3) model, both of which use Gaussian algorithms.

e. Pollutant Types

EDMS includes emission factors for carbon monoxide, nitrogen oxides, sulfur oxides, hydrocarbons, and suspended particles and calculates the dispersion for all except hydrocarbons.

f. Source-Receptor Relationship

(1) Within hardware and memory constraints, there is no upper limit to the number of sources and receptors that can be modeled simultaneously.

(2) The Gaussian point source equation estimates concentrations from point sources after determining the effective height of emission and the upwind and crosswind distance of the source from the receptor. Numerical integration of the Gaussian point source equation is used to determine concentrations from line sources (runways). Integration over area sources (parking lots), which includes edge effects from the source region, is done by considering finite line sources perpendicular to the wind at intervals upwind from the receptor. The crosswind integration is done analytically; integration upwind is done numerically by successive approximations. Terrain elevation differences between sources and receptors are neglected.

(3) A reasonable height above ground level may be specified for each receptor.

g. Plume Behavior

(1) Briggs final plume rise equations are used. If plume height exceeds mixing height, concentrations are assumed equal to zero. Surface concentrations are set to zero when the plume centerline exceeds mixing height.

(2) For roadways, plume rise is not treated.

(3) Building and stack tip downwash effects are not treated.

h. Horizontal Winds

(1) Steady state winds are assumed for each hour. Winds are assumed to be constant with altitude.

(2) Winds are entered manually by the user or automatically by reading previously loaded NCDC annual data files.

i. Vertical Wind Speed

Vertical wind speed is assumed to be zero.

j. Horizontal Dispersion

(1) Six stability classes are used (P–G classes A through F).

(2) Aircraft runways, vehicle parking lots, stationary sources, and training fires are modeled using PAL2. Either rural (Pasquill-Gifford) or urban (Briggs) dispersion settings may be specified globally for these sources.

(3) Vehicle roadways, aircraft taxiways, and aircraft queues are modeled using CALINE3. CALINE3 assumes urban dispersion curves. The user specifies terrain roughness.

k. Vertical Dispersion

(1) Six stability classes are used (P–G classes A through F).

(2) Aircraft runways, vehicle parking lots, stationary sources, and training fires are modeled using PAL2. Either rural (Pasquill-Gifford) or urban (Briggs) dispersion settings may be specified globally for these sources.

(3) Vehicle roadways, aircraft taxiways, and aircraft queues are modeled using CALINE3. CALINE3 assumes urban dispersion curves. The user specifies terrain roughness.

l. Chemical Transformation

Chemical transformations are not accounted for.

m. Physical Removal

Deposition is not treated.

n. Evaluation Studies

None cited.

A.5 Industrial Source Complex Model (ISC3)

Reference

Environmental Protection Agency, 1995. User's Guide for the Industrial Source Complex (ISC3) Dispersion Models, Volumes 1 and 2. EPA Publication Nos. EPA–454/B–95–003a & b. Environmental Protection Agency, Research Triangle Park, NC. (NTIS Nos. PB 95–222741 and PB 95–222758, respectively)

Availability

The model code is available on the EPA's Internet SCRAM website. ISCST3 (as PB 2002–500055) is also available on diskette from the National Technical Information Service (see Section A.0).

Abstract

The ISC3 model is a steady-state Gaussian plume model which can be used to assess pollutant concentrations from a wide variety of sources associated with an industrial source complex. This model can account for the following: Settling and dry deposition of particles; downwash; area, line and volume sources; plume rise as a function of downwind distance; separation of point sources; and limited terrain adjustment. ISC3 operates in both long-term and short-term modes.

a. Recommendations for Regulatory Use

ISC3 is appropriate for the following applications:

• Industrial source complexes;
• Rural or urban areas;
• Flat or rolling terrain;
• Transport distances less than 50 kilometers;
• 1-hour to annual averaging times; and
• Continuous toxic air emissions.

The following options should be selected for regulatory applications: For short term or long term modeling, set the regulatory "default option"; *i.e.*, use the keyword *DFAULT*, which automatically selects stack tip downwash, final plume rise, buoyancy induced dispersion (BID), the vertical potential temperature gradient, a treatment for calms, the appropriate wind profile exponents, the appropriate value for pollutant half-life, and a revised building wake effects algorithm; set the "rural option" (use the keyword *RURAL*) or "urban option" (use the keyword *URBAN*); and set the "concentration option" (use the keyword *CONC*).

b. Input Requirements

Source data: Location, emission rate, physical stack height, stack gas exit velocity, stack inside diameter, and stack gas temperature. Optional inputs include source elevation, building dimensions, particle size distribution with corresponding settling velocities, and surface reflection coefficients.

Meteorological data: ISCST3 requires hourly surface weather data from the preprocessor program RAMMET, which provides hourly stability class, wind direction, wind speed, temperature, and mixing height. For ISCLT3, input includes stability wind rose (STAR deck), average afternoon mixing height, average morning mixing height, and average air temperature.

Receptor data: Coordinates and optional ground elevation for each receptor.

c. Output

Printed output options include:

• Program control parameters, source data, and receptor data;
• Tables of hourly meteorological data for each specified day;
• "N"-day average concentration or total deposition calculated at each receptor for any desired source combinations;
• Concentration or deposition values calculated for any desired source combinations at all receptors for any specified day or time period within the day;
• Tables of highest and second highest concentration or deposition values calculated at each receptor for each specified time period during a(n) "N"-day period for any desired source combinations, and tables of the maximum 50 concentration or deposition values calculated for any desired source combinations for each specified time period.

d. Type of Model

ISC3 is a Gaussian plume model. It has been revised to perform a double integration of the Gaussian plume kernel for area sources.

e. Pollutant Types

ISC3 may be used to model primary pollutants and continuous releases of toxic and hazardous waste pollutants. Settling and deposition are treated.

f. Source-Receptor Relationships

ISC3 applies user-specified locations for point, line, area and volume sources, and user-specified receptor locations or receptor rings.

User input topographic evaluation for each receptor is used. Elevations above stack top are reduced to the stack top elevation, *i.e.*, "terrain chopping".

User input height above ground level may be used when necessary to simulate impact at elevated or "flag pole" receptors, *e.g.*, on buildings.

Actual separation between each source-receptor pair is used.

g. Plume Behavior

ISC3 uses Briggs (1969, 1971, 1975) plume rise equations for final rise.

Stack tip downwash equation from Briggs (1974) is used.

Revised building wake effects algorithm is used. For stacks higher than building height plus one-half the lesser of the building height or building width, the building wake algorithm of Huber and Snyder (1976) is used. For lower stacks, the building wake algorithm of Schulman and Scire (Schulman and Hanna, 1986) is used, but stack tip downwash and BID are not used.

For rolling terrain (terrain not above stack height), plume centerline is horizontal at height of final rise above source.

Fumigation is not treated.

h. Horizontal Winds

Constant, uniform (steady-state) wind is assumed for each hour.

Straight line plume transport is assumed to all downwind distances.

Separate wind speed profile exponents (Irwin, 1979; EPA, 1980) for both rural and urban cases are used.

An optional treatment for calm winds is included for short term modeling.

i. Vertical Wind Speed

Vertical wind speed is assumed equal to zero.

j. Horizontal Dispersion

Rural dispersion coefficients from Turner (1969) are used, with no adjustments for surface roughness or averaging time.

Urban dispersion coefficients from Briggs (Gifford, 1976) are used.

Buoyancy induced dispersion (Pasquill, 1976) is included.

Six stability classes are used.

k. Vertical Dispersion

Rural dispersion coefficients from Turner (1969) are used, with no adjustments for surface roughness.

Urban dispersion coefficients from Briggs (Gifford, 1976) are used.

Buoyancy induced dispersion (Pasquill, 1976) is included.

Six stability classes are used.

Mixing height is accounted for with multiple reflections until the vertical plume standard deviation equals 1.6 times the mixing height; uniform vertical mixing is assumed beyond that point.

Perfect reflection is assumed at the ground.

l. Chemical Transformation

Chemical transformations are treated using exponential decay. Time constant is input by the user.

m. Physical Removal

Dry deposition effects for particles are treated using a resistance formulation in which the deposition velocity is the sum of the resistances to pollutant transfer within the surface layer of the atmosphere, plus a gravitational settling term (EPA, 1994), based on the modified surface depletion scheme of Horst (1983).

n. Evaluation Studies

Bowers, J.F. and A.J. Anderson, 1981. An Evaluation Study for the Industrial Source Complex (ISC) Dispersion Model, EPA Publication No. EPA–450/4–81–002. Office of Air Quality Planning & Standards, Research Triangle Park, NC.

Bowers, J.F., A.J. Anderson and W.R. Hargraves, 1982. Tests of the Industrial Source Complex (ISC) Dispersion Model at the Armco Middletown, Ohio Steel Mill. EPA Publication No. EPA–450/4–82–006. Office of Air Quality Planning & Standards, Research Triangle Park, NC.

Environmental Protection Agency, 1992. Comparison of a Revised Area Source Algorithm for the Industrial Source Complex Short Term Model and Wind Tunnel Data. EPA Publication No. EPA–454/R–92–014. Office of Air Quality Planning & Standards, Research Triangle Park, NC. (NTIS No. PB 93–226751)

Environmental Protection Agency, 1992. Sensitivity Analysis of a Revised Area Source Algorithm for the Industrial Source Complex Short Term Model. EPA Publication No. EPA–454/R–92–015. Office of Air Quality Planning & Standards, Research Triangle Park, NC. (NTIS No. PB 93–226769)

Environmental Protection Agency, 1992. Development and Evaluation of a Revised Area Source Algorithm for the Industrial Source Complex Long Term Model. EPA Publication No. EPA–454/R–92–016. Office of Air Quality Planning & Standards, Research Triangle Park, NC. (NTIS No. PB 93–226777)

Environmental Protection Agency, 1994. Development and Testing of a Dry Deposition Algorithm (Revised). EPA Publication No. EPA–454/R–94–015. Office of Air Quality Planning & Standards, Research Triangle Park, NC. (NTIS No. PB 94–183100)

Scire, J.S. and L.L. Schulman, 1981. Evaluation of the BLP and ISC Models with SF_6 Tracer Data and SO_2 Measurements at Aluminum Reduction Plants. Air Pollution Control Association Specialty Conference on Dispersion Modeling for Complex Sources, St. Louis, MO.

Schulman, L.L. and S.R. Hanna, 1986. Evaluation of Downwash Modification to the Industrial Source Complex Model. *Journal of the Air Pollution Control Association*, 36: 258–264.

A.7 Offshore and Coastal Dispersion Model (OCD)

Reference

DiCristofaro, D.C. and S.R. Hanna, 1989. OCD: The Offshore and Coastal Dispersion Model, Version 4. Volume I: User's Guide, and Volume II: Appendices. Sigma Research Corporation, Westford, MA. (NTIS Nos. PB 93–144384 and PB 93–144392)

Availability

This model code is available on the EPA's Internet SCRAM Web site and also on diskette (as PB 91–505230) from the National Technical Information Service (see Section A.0). Official contact at Minerals Management Service: Mr. Dirk Herkhof, Parkway Atrium Building, 381 Elden Street, Herndon, VA 20170, Phone: (703) 787–1735.

Abstract

(1) OCD is a straight-line Gaussian model developed to determine the impact of offshore emissions from point, area or line sources on the air quality of coastal regions. OCD incorporates overwater plume transport and dispersion as well as changes that occur as the plume crosses the shoreline. Hourly meteorological data are needed from both offshore and onshore locations. These include water surface temperature, overwater air temperature, mixing height, and relative humidity.

(2) Some of the key features include platform building downwash, partial plume penetration into elevated inversions, direct use of turbulence intensities for plume dispersion, interaction with the overland internal boundary layer, and continuous shoreline fumigation.

a. Recommendations for Regulatory Use

OCD has been recommended for use by the Minerals Management Service for emissions located on the Outer Continental Shelf. OCD is applicable for overwater sources where onshore receptors are below the lowest source height. Where onshore receptors are above the lowest source height, offshore plume transport and dispersion may be modeled on a case-by-case basis in consultation with the appropriate reviewing authority (paragraph 3.0(b)).

b. Input Requirements

(1) Source data: Point, area or line source location, pollutant emission rate, building height, stack height, stack gas temperature, stack inside diameter, stack gas exit velocity, stack angle from vertical, elevation of stack base above water surface and gridded specification of the land/water surfaces. As an option, emission rate, stack gas exit velocity and temperature can be varied hourly.

(2) Meteorological data (over water): Wind direction, wind speed, mixing height, relative humidity, air temperature, water surface temperature, vertical wind direction shear (optional), vertical temperature gradient (optional), turbulence intensities (optional).

(3) Meteorological data (over land): Wind direction, wind speed, temperature, stability class, mixing height.

(4) Receptor data: Location, height above local ground-level, ground-level elevation above the water surface.

c. Output

(1) All input options, specification of sources, receptors and land/water map including locations of sources and receptors.

(2) Summary tables of five highest concentrations at each receptor for each averaging period, and average concentration for entire run period at each receptor.

(3) Optional case study printout with hourly plume and receptor characteristics. Optional table of annual impact assessment from non-permanent activities.

(4) Concentration files written to disk or tape can be used by ANALYSIS postprocessor to produce the highest concentrations for each receptor, the cumulative frequency distributions for each receptor, the tabulation of all concentrations exceeding a given threshold, and the manipulation of hourly concentration files.

d. Type of Model

OCD is a Gaussian plume model constructed on the framework of the MPTER model.

e. Pollutant Types

OCD may be used to model primary pollutants. Settling and deposition are not treated.

f. Source-Receptor Relationship

(1) Up to 250 point sources, 5 area sources, or 1 line source and 180 receptors may be used.

(2) Receptors and sources are allowed at any location.

(3) The coastal configuration is determined by a grid of up to 3600 rectangles. Each element of the grid is designated as either land or water to identify the coastline.

g. Plume Behavior

(1) As in ISC, the basic plume rise algorithms are based on Briggs' recommendations.

(2) Momentum rise includes consideration of the stack angle from the vertical.

(3) The effect of drilling platforms, ships, or any overwater obstructions near the source are used to decrease plume rise using a revised platform downwash algorithm based on laboratory experiments.

(4) Partial plume penetration of elevated inversions is included using the suggestions of Briggs (1975) and Weil and Brower (1984).

(5) Continuous shoreline fumigation is parameterized using the Turner method where complete vertical mixing through the thermal internal boundary layer (TIBL) occurs as soon as the plume intercepts the TIBL.

h. Horizontal Winds

(1) Constant, uniform wind is assumed for each hour.

(2) Overwater wind speed can be estimated from overland wind speed using relationship of Hsu (1981).

(3) Wind speed profiles are estimated using similarity theory (Businger, 1973). Surface layer fluxes for these formulas are calculated from bulk aerodynamic methods.

i. Vertical Wind Speed

Vertical wind speed is assumed equal to zero.

j. Horizontal Dispersion

(1) Lateral turbulence intensity is recommended as a direct estimate of horizontal dispersion. If lateral turbulence intensity is not available, it is estimated from boundary layer theory. For wind speeds less than 8 m/s, lateral turbulence intensity is assumed inversely proportional to wind speed.

(2) Horizontal dispersion may be enhanced because of obstructions near the source. A virtual source technique is used to simulate the initial plume dilution due to downwash.

(3) Formulas recommended by Pasquill (1976) are used to calculate buoyant plume enhancement and wind direction shear enhancement.

(4) At the water/land interface, the change to overland dispersion rates is modeled using a virtual source. The overland dispersion rates can be calculated from either lateral turbulence intensity or Pasquill-Gifford curves. The change is implemented where the plume intercepts the rising internal boundary layer.

k. Vertical Dispersion

(1) Observed vertical turbulence intensity is not recommended as a direct estimate of vertical dispersion. Turbulence intensity should be estimated from boundary layer theory as default in the model. For very stable conditions, vertical dispersion is also a function of lapse rate.

(2) Vertical dispersion may be enhanced because of obstructions near the source. A virtual source technique is used to simulate the initial plume dilution due to downwash.

(3) Formulas recommended by Pasquill (1976) are used to calculate buoyant plume enhancement.

(4) At the water/land interface, the change to overland dispersion rates is modeled using a virtual source. The overland dispersion rates can be calculated from either vertical turbulence intensity or the Pasquill-Gifford coefficients. The change is implemented where the plume intercepts the rising internal boundary layer.

l. Chemical Transformation

Chemical transformations are treated using exponential decay. Different rates can be specified by month and by day or night.

m. Physical Removal

Physical removal is also treated using exponential decay.

n. Evaluation Studies

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Zhang, X., 1993. A computational analysis of the rise, dispersion, and deposition of buoyant plumes. Ph.D. Thesis, Massachusetts Institute of Technology, Cambridge, MA.

Zhang, X. and A.F. Ghoniem, 1993. A computational model for the rise and dispersion of wind-blown, buoyancy-driven plumes—I. Neutrally stratified atmosphere. *Atmospheric Environment*, 15: 2295—2311.

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mixing height; uniform mixing is assumed beyond that point.

(4) Perfect reflection at the ground is assumed.

l. Chemical Transformation

Chemical transformations are treated using linear decay. Decay rate is input by the user.

m. Physical Removal

Physical removal is not explicitly treated.

n. Evaluation Studies

Schulman, L.L. and J.S. Scire, 1980. Buoyant Line and Point Source (BLP) Dispersion Model User's Guide, P–7304B. Environmental Research and Technology, Inc., Concord, MA.

Scire, J.S. and L.L. Schulman, 1981. Evaluation of the BLP and ISC Models with SF_6 Tracer Data and SO_2 Measurements at Aluminum Reduction Plants. APCA Specialty Conference on Dispersion Modeling for Complex Sources, St. Louis, MO.

A.3 CALINE3

Reference

Benson, Paul E., 1979. CALINE3—A Versatile Dispersion Model for Predicting Air Pollutant Levels Near Highways and Arterial Streets. Interim Report, Report Number FHWA/CA/TL–79/23. Federal Highway Administration, Washington, DC (NTIS No. PB 80–220841).

Availability

The CALINE3 model is available on diskette (as PB 95–502712) from NTIS. The source code and user's guide are also available on EPA's Internet SCRAM Web site (Section A.0).

Abstract

CALINE3 can be used to estimate the concentrations of nonreactive pollutants from highway traffic. This steady-state Gaussian model can be applied to determine air pollution concentrations at receptor locations downwind of "at-grade," "fill," "bridge," and "cut section" highways located in relatively uncomplicated terrain. The model is applicable for any wind direction, highway orientation, and receptor location. The model has adjustments for averaging time and surface roughness, and can handle up to 20 links and 20 receptors. It also contains an algorithm for deposition and settling velocity so that particulate concentrations can be predicted.

a. Recommendations for Regulatory Use

CALINE–3 is appropriate for the following applications:

- Highway (line) sources;
- Urban or rural areas;
- Simple terrain;
- Transport distances less than 50 kilometers; and
- One-hour to 24-hour averaging times.

b. Input Requirements

(1) Source data: up to 20 highway links classed as "at-grade," "fill," "bridge," or "depressed"; coordinates of link end points; traffic volume; emission factor; source height; and mixing zone width.

(2) Meteorological data: wind speed, wind angle (measured in degrees clockwise from the Y axis), stability class, mixing height, ambient (background to the highway) concentration of pollutant.

(3) Receptor data: coordinates and height above ground for each receptor.

c. Output

Printed output includes concentration at each receptor for the specified meteorological condition.

d. Type of Model

CALINE–3 is a Gaussian plume model.

e. Pollutant Types

CALINE–3 may be used to model primary pollutants.

f. Source-Receptor Relationship

(1) Up to 20 highway links are treated.

(2) CALINE–3 applies user input location and emission rate for each link. User-input receptor locations are applied.

g. Plume Behavior

Plume rise is not treated.

h. Horizontal Winds

(1) User-input hourly wind speed and direction are applied.

(2) Constant, uniform (steady-state) wind is assumed for an hour.

i. Vertical Wind Speed

Vertical wind speed is assumed equal to zero.

j. Horizontal Dispersion

(1) Six stability classes are used.

(2) Rural dispersion coefficients from Turner (1969) are used, with adjustment for roughness length and averaging time.

(3) Initial traffic-induced dispersion is handled implicitly by plume size parameters.

k. Vertical Dispersion

(1) Six stability classes are used.

(2) Empirical dispersion coefficients from Benson (1979) are used including an adjustment for roughness length.

(3) Initial traffic-induced dispersion is handled implicitly by plume size parameters.

(4) Adjustment for averaging time is included.

l. Chemical Transformation

Not treated.

m. Physical Removal

Optional deposition calculations are included.

n. Evaluation Studies

Bemis, G.R. *et al.*, 1977. Air Pollution and Roadway Location, Design, and Operation—Project Overview. FHWA–CA–TL–7080–77–25, Federal Highway Administration, Washington, DC.

Cadle, S.H. *et al.*, 1976. Results of the General Motors Sulfate Dispersion Experiment, GMR–2107. General Motors Research Laboratories, Warren, MI.

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Environmental Protection Agency, 1986. Evaluation of Mobile Source Air Quality Simulation Models. EPA Publication No. EPA–450/4–86–002. Office of Air Quality Planning & Standards, Research Triangle Park, NC. (NTIS No. PB 86–167293)

A.4 CALPUFF

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Scire J.S., F.R. Robe, M.E. Fernau and R.J. Yamartino, 2000. A User's Guide for the CALMET Meteorological Model (Version 5.0). Earth Tech, Inc., Concord, MA.

Availability

The model code and its documentation are available at no cost for download from the model developers' Internet Web site: *http://www.src.com/calpuff/calpuff1.htm*. You may also contact Joseph Scire, Earth Tech, Inc., 196 Baker Avenue, Concord, MA 01742; Telephone: (978) 371–4270; Fax: (978) 371–2468; e-mail: *JScire@alum.mit.edu*.

Abstract

CALPUFF is a multi-layer, multi-species non-steady-state puff dispersion modeling system that simulates the effects of time- and space-varying meteorological conditions on pollutant transport, transformation, and removal. CALPUFF is intended for use on scales from tens of meters from a source to hundreds of kilometers. It includes algorithms for near-field effects such as stack tip downwash, building downwash, transitional buoyant and momentum plume rise, rain cap effects, partial plume penetration, subgrid scale terrain and coastal interactions effects, and terrain impingement as well as longer range effects such as pollutant removal due to wet scavenging and dry deposition, chemical transformation, vertical wind shear effects, overwater transport, plume fumigation, and visibility effects of particulate matter concentrations.

a. Recommendations for Regulatory Use

(1) CALPUFF is appropriate for long range transport (source-receptor distances of 50 to several hundred kilometers) of emissions from point, volume, area, and line sources. The meteorological input data should be fully characterized with time-and-space-varying three dimensional wind and meteorological conditions using CALMET, as discussed in paragraphs 8.3(d) and 8.3.1.2(d) of Appendix W.

(2) CALPUFF may also be used on a case-by-case basis if it can be demonstrated using the criteria in Section 3.2 that the model is more appropriate for the specific application. The purpose of choosing a modeling system like CALPUFF is to fully treat stagnation, wind reversals, and time and space variations of meteorological conditions on transport and dispersion, as discussed in paragraph 7.2.8(a).

(3) For regulatory applications of CALMET and CALPUFF, the regulatory default option should be used. Inevitably, some of the model control options will have to be set specific for the application using expert judgment and in consultation with the appropriate reviewing authorities.

b. Input Requirements

Source Data:

1. Point sources: Source location, stack height, diameter, exit velocity, exit temperature, base elevation, wind direction specific building dimensions (for building downwash calculations), and emission rates for each pollutant. Particle size distributions may be entered for particulate matter. Temporal emission factors (diurnal cycle, monthly cycle, hour/season, wind speed/stability class, or temperature-dependent emission factors) may also be entered. Arbitrarily-varying point source parameters may be entered from an external file.

2. Area sources: Source location and shape, release height, base elevation, initial vertical distribution (σ_z) and emission rates for each pollutant. Particle size distributions may be entered for particulate matter. Temporal emission factors (diurnal cycle, monthly cycle, hour/season, wind speed/stability class, or temperature-dependent emission factors) may also be entered. Arbitrarily-varying area source parameters may be entered from an external file. Area sources specified in the external file are allowed to be buoyant and their location, size, shape, and other source characteristics are allowed to change in time.

3. Volume sources: Source location, release height, base elevation, initial horizontal and vertical distributions (σ_y, σ_z) and emission rates for each pollutant. Particle size distributions may be entered for particulate matter. Temporal emission factors (diurnal cycle, monthly cycle, hour/season, wind speed/stability class, or temperature-dependent emission factors) may also be entered. Arbitrarily-varying volume source parameters may be entered from an external file. Volume sources with buoyancy can be simulated by treating the source as a point source and entering initial plume size parameters—initial (σ_y, σ_z)—to define the initial size of the volume source.

4. Line sources: Source location, release height, base elevation, average buoyancy parameter, and emission rates for each pollutant. Building data may be entered for line source emissions experiencing building downwash effects. Particle size distributions may be entered for particulate matter. Temporal emission factors (diurnal cycle, monthly cycle, hour/season, wind speed/stability class, or temperature-dependent emission factors) may also be entered. Arbitrarily-varying line source parameters may be entered from an external file.

Meteorological Data (different forms of meteorological input can be used by CALPUFF):

1. Time-dependent three-dimensional (3-D) meteorological fields generated by CALMET. This is the preferred mode for running CALPUFF. Data inputs used by CALMET include surface observations of wind speed, wind direction, temperature, cloud cover, ceiling height, relative humidity, surface pressure, and precipitation (type and amount), and upper air sounding data (wind speed, wind direction, temperature, and height) and air-sea temperature differences (over water). Optional 3-D meteorological prognostic model output (e.g., from models such as MM5, RUC, Eta and RAMS) can be used by CALMET as well (paragraph 8.3.1.2(d)). CALMET contains an option to be run in "No-observations" mode (Robe et al., 2002), which allows the 3-D CALMET meteorological fields to be based on prognostic model output alone, without observations. This allows CALMET and CALPUFF to be run in prognostic mode for forecast applications.

2. Single station surface and upper air meteorological data in CTDMPLUS data file formats (SURFACE.DAT and PROFILE.DAT files) or AERMOD data file formats. These options allow a vertical variation in the meteorological parameters but no horizontal spatial variability.

3. Single station meteorological data in ISCST3 data file format. This option does not account for variability of the meteorological parameters in the horizontal or vertical, except as provided for by the use of stability-dependent wind shear exponents and average temperature lapse rates.

Gridded terrain and land use data are required as input into CALMET when Option 1 is used. Geophysical processor programs are provided that interface the modeling system to standard terrain and land use data bases available from various sources such as the U.S. Geological Survey (USGS) and the National Aeronautics and Space Administration (NASA).

Receptor Data:

CALPUFF includes options for gridded and non-gridded (discrete) receptors. Special subgrid-scale receptors are used with the subgrid-scale complex terrain option. An option is provided for discrete receptors to be placed at ground-level or above the local ground level (i.e., flagpole receptors). Gridded and subgrid-scale receptors are placed at the local ground level only.

Other Input:

CALPUFF accepts hourly observations of ozone concentrations for use in its chemical transformation algorithm. Monthly concentrations of ammonia concentrations can be specified in the CALPUFF input file, although higher time-resolution ammonia variability can be computed using the POSTUTIL program. Subgrid-scale coastlines can be specified in its coastal boundary file. Optional, user-specified deposition velocities and chemical transformation rates can also be entered. CALPUFF accepts the CTDMPLUS terrain and receptor files for use in its subgrid-scale terrain algorithm. Inflow boundary conditions of modeled pollutants can be specified in a boundary condition file. Liquid water content variables including cloud water/ice and precipitation water/ice can be used as input for visibility analyses and other CALPUFF modules.

c. Output

CALPUFF produces files of hourly concentrations of ambient concentrations for each modeled species, wet deposition fluxes, dry deposition fluxes, and for visibility applications, extinction coefficients. Postprocessing programs (PRTMET, CALPOST, CALSUM, APPEND, and POSTUTIL) provide options for summing, scaling, analyzing and displaying the modeling results. CALPOST contains options for computing of light extinction (visibility) and POSTUTIL allows the re-partitioning of nitric acid and nitrate to account for the effects of ammonia limitation (Scire *et al.*, 2001; Escoffier-Czaja and Scire, 2002). CALPUFF contains an options to output liquid water concentrations for use in computing visible plume lengths and frequency of icing and fogging from cooling towers and other water vapor sources. The CALPRO Graphical User Interface (GUI) contains options for creating graphics such as contour plots, vector plots and other displays when linked to graphics software.

d. Type of Model

(1) CALPUFF is a non-steady-state time- and space-dependent Gaussian puff model. CALPUFF treats primary pollutants and simulates secondary pollutant formation using a parameterized, quasi-linear chemical conversion mechanism. Pollutants treated include SO_2, $SO_4^=$, NO_X (i.e., NO + NO_2), HNO_3, NO_3^-, NH_3, PM-10, PM-2.5, toxic pollutants and others pollutant species that are either inert or subject to quasi-linear chemical reactions. The model includes a resistance-based dry deposition model for both gaseous pollutants and particulate matter. Wet deposition is treated using a scavenging coefficient approach. The model has detailed parameterizations of complex terrain effects, including terrain impingement, side-wall scrapping, and steep-walled terrain influences on lateral plume growth. A subgrid-scale complex terrain module based on a dividing streamline concept divides the flow into a lift component traveling over the obstacle and a wrap component deflected around the obstacle.

(2) The meteorological fields used by CALPUFF are produced by the CALMET meteorological model. CALMET includes a diagnostic wind field model containing parameterized treatments of slope flows, valley flows, terrain blocking effects, and kinematic terrain effects, lake and sea breeze circulations, a divergence minimization procedure, and objective analysis of observational data. An energy-balance scheme is used to compute sensible and latent heat fluxes and turbulence parameters over land surfaces. A profile method is used over water. CALMET contains interfaces to prognostic meteorological models such as the Penn State/NCAR Mesoscale Model (e.g., MM5; Section 12.0, ref. 86), as well as the RAMS, Ruc and Eta models.

e. Pollutant Types

CALPUFF may be used to model gaseous pollutants or particulate matter that are inert or which undergo quasi-linear chemical reactions, such as SO_2, SO_4 =, NO_X (*i.e.*, NO + NO_2), HNO_3, NO_3^-, NH_3, PM-10, PM-2.5 and toxic pollutants. For regional haze analyses, sulfate and nitrate particulate components are explicitly treated.

f. Source-Receptor Relationships

CALPUFF contains no fundamental limitations on the number of sources or receptors. Parameter files are provided that allow the user to specify the maximum number of sources, receptors, puffs, species, grid cells, vertical layers, and other model parameters. Its algorithms are designed to be suitable for source-receptor distances from tens of meters to hundreds of kilometers.

g. Plume Behavior

Momentum and buoyant plume rise is treated according to the plume rise equations of Briggs (1975) for non-downwashing point sources, Schulman and Scire (1980) for line sources and point sources subject to building downwash effects using the Schulman-Scire downwash algorithm, and Zhang (1993) for buoyant area sources and point sources affected by building downwash when using the PRIME building downwash method. Stack tip downwash effects and partial plume penetration into elevated temperature inversions are included. An algorithm to treat horizontally-oriented vents and stacks with rain caps is included.

h. Horizontal Winds

A three-dimensional wind field is computed by the CALMET meteorological model. CALMET combines an objective analysis procedure using wind observations with parameterized treatments of slope flows, valley flows, terrain kinematic effects, terrain blocking effects, and sea/lake breeze circulations. CALPUFF may optionally use single station (horizontally-constant) wind fields in the CTDMPLUS, AERMOD or ISCST3 data formats.

i. Vertical Wind Speed

Vertical wind speeds are not used explicitly by CALPUFF. Vertical winds are used in the development of the horizontal wind components by CALMET.

j. Horizontal Dispersion

Turbulence-based dispersion coefficients provide estimates of horizontal plume dispersion based on measured or computed values of σ_v. The effects of building downwash and buoyancy-induced dispersion are included. The effects of vertical wind shear are included through the puff splitting algorithm. Options are provided to use Pasquill-Gifford (rural) and McElroy-Pooler (urban) dispersion coefficients. Initial plume size from area or volume sources is allowed.

k. Vertical Dispersion

Turbulence-based dispersion coefficients provide estimates of vertical plume dispersion based on measured or computed values of σ_w. The effects of building downwash and buoyancy-induced dispersion are included. Vertical dispersion during convective conditions is simulated with a probability density function (pdf) model based on Weil *et al.* (1997). Options are provided to use Pasquill-Gifford (rural) and McElroy-Pooler (urban) dispersion coefficients. Initial plume size from area or volume sources is allowed.

l. Chemical Transformation

Gas phase chemical transformations are treated using parameterized models of SO_2 conversion to SO_4= and NO conversion to NO_3-, HNO_3, and NO_2. Organic aerosol formation is treated. The POSTUTIL program contains an option to re-partition HNO_3 and NO_3- in order to treat the effects of ammonia limitation.

m. Physical Removal

Dry deposition of gaseous pollutants and particulate matter is parameterized in terms of a resistance-based deposition model. Gravitational settling, inertial impaction, and Brownian motion effects on deposition of particulate matter is included. CALPUFF contains an option to evaluate the effects of plume tilt resulting from gravitational settling. Wet deposition of gases and particulate matter is parameterized in terms of a scavenging coefficient approach.

n. Evaluation Studies

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Chang, J.C., P. Franzese, K. Chayantrakom and S.R. Hanna, 2001. Evaluations of CALPUFF, HPAC and VLSTRACK with Two Mesoscale Field Datasets. *Journal of Applied Meteorology*, 42(4): 453–466.

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Strimaitis, D.G., J.S. Scire and J.C. Chang, 1998. Evaluation of the CALPUFF Dispersion Model with Two Power Plant Data Sets. Tenth Joint Conference on the Application of Air Pollution Meteorology, Phoenix, Arizona. American Meteorological Society, Boston, MA. January 11–16, 1998.

A.5 Complex Terrain Dispersion Model Plus Algorithms for Unstable Situations (CTDMPLUS)

Reference

Perry, S.G., D.J. Burns, L.H. Adams, R.J. Paine, M.G. Dennis, M.T. Mills, D.G. Strimaitis, R.J. Yamartino and E.M. Insley, 1989. User's Guide to the Complex Terrain Dispersion Model Plus Algorithms for Unstable Situations (CTDMPLUS). Volume 1: Model Descriptions and User Instructions. EPA Publication No. EPA–600/8–89–041. Environmental Protection Agency, Research Triangle Park, NC. (NTIS No. PB 89–181424)

Perry, S.G., 1992. CTDMPLUS: A Dispersion Model for Sources near Complex Topography. Part I: Technical Formulations. *Journal of Applied Meteorology*, 31(7): 633–645.

Availability

This model code is available on EPA's Internet SCRAM Web site and also on diskette (as PB 90–504119) from the National Technical Information Service (Section A.0).

Abstract

CTDMPLUS is a refined point source Gaussian air quality model for use in all stability conditions for complex terrain applications. The model contains, in its entirety, the technology of CTDM for stable and neutral conditions. However, CTDMPLUS can also simulate daytime, unstable conditions, and has a number of additional capabilities for improved user friendliness. Its use of meteorological data and terrain information is different from other EPA models; considerable detail for both types of input data is required and is supplied by preprocessors specifically designed for CTDMPLUS. CTDMPLUS requires the parameterization of individual hill shapes using the terrain preprocessor and the association of each model receptor with a particular hill.

a. Recommendation for Regulatory Use

CTDMPLUS is appropriate for the following applications:

- Elevated point sources;
- Terrain elevations above stack top;
- Rural or urban areas;
- Transport distances less than 50 kilometers; and
- One hour to annual averaging times when used with a post-processor program such as CHAVG.

b. Input Requirements

(1) Source data: For each source, user supplies source location, height, stack diameter, stack exit velocity, stack exit temperature, and emission rate; if variable emissions are appropriate, the user supplies hourly values for emission rate, stack exit velocity, and stack exit temperature.

(2) Meteorological data: For applications of CTDMPLUS, multiple level (typically three or more) measurements of wind speed and direction, temperature and turbulence (wind fluctuation statistics) are required to create the basic meteorological data file ("PROFILE"). Such measurements should be obtained up to the representative plume height(s) of interest (*i.e.*, the plume height(s) under those conditions important to the determination of the design concentration). The representative plume height(s) of interest should be determined using an appropriate complex terrain screening procedure (*e.g.*, CTSCREEN) and should be documented in the monitoring/modeling protocol. The necessary meteorological measurements should be obtained from an appropriately

sited meteorological tower augmented by SODAR and/or RASS if the representative plume height(s) of interest is above the levels represented by the tower measurements. Meteorological preprocessors then create a SURFACE data file (hourly values of mixed layer heights, surface friction velocity, Monin-Obukhov length and surface roughness length) and a RAWINsonde data file (upper air measurements of pressure, temperature, wind direction, and wind speed).

(3) Receptor data: receptor names (up to 400) and coordinates, and hill number (each receptor must have a hill number assigned).

(4) Terrain data: user inputs digitized contour information to the terrain preprocessor which creates the TERRAIN data file (for up to 25 hills).

c. Output

(1) When CTDMPLUS is run, it produces a concentration file, in either binary or text format (user's choice), and a list file containing a verification of model inputs, *i.e.*,

- Input meteorological data from "SURFACE" and "PROFILE".
- Stack data for each source.
- Terrain information.
- Receptor information.
- Source-receptor location (line printer map).

(2) In addition, if the case-study option is selected, the listing includes:

- Meteorological variables at plume height.
- Geometrical relationships between the source and the hill.
- Plume characteristics at each receptor, *i.e.*,

—Distance in along-flow and cross flow direction
—Effective plume-receptor height difference
—Effective σ_y & σ_z values, both flat terrain and hill induced (the difference shows the effect of the hill)
—Concentration components due to WRAP, LIFT and FLAT.

(3) If the user selects the TOPN option, a summary table of the top 4 concentrations at each receptor is given. If the ISOR option is selected, a source contribution table for every hour will be printed.

(4) A separate disk file of predicted (1-hour only) concentrations ("CONC") is written if the user chooses this option. Three forms of output are possible:

(i) A binary file of concentrations, one value for each receptor in the hourly sequence as run;

(ii) A text file of concentrations, one value for each receptor in the hourly sequence as run; or

(iii) A text file as described above, but with a listing of receptor information (names, positions, hill number) at the beginning of the file.

(3) Hourly information provided to these files besides the concentrations themselves includes the year, month, day, and hour information as well as the receptor number with the highest concentration.

d. Type of Model

CTDMPLUS is a refined steady-state, point source plume model for use in all stability conditions for complex terrain applications.

e. Pollutant Types

CTDMPLUS may be used to model non-reactive, primary pollutants.

f. Source-Receptor Relationship

Up to 40 point sources, 400 receptors and 25 hills may be used. Receptors and sources are allowed at any location. Hill slopes are assumed not to exceed 15°, so that the linearized equation of motion for Boussinesq flow are applicable. Receptors upwind of the impingement point, or those associated with any of the hills in the modeling domain, require separate treatment.

g. Plume Behavior

(1) As in CTDM, the basic plume rise algorithms are based on Briggs' (1975) recommendations.

(2) A central feature of CTDMPLUS for neutral/stable conditions is its use of a critical dividing-streamline height (H_c) to separate the flow in the vicinity of a hill into two separate layers. The plume component in the upper layer has sufficient kinetic energy to pass over the top of the hill while streamlines in the lower portion are constrained to flow in a horizontal plane around the hill. Two separate components of CTDMPLUS compute ground-level concentrations resulting from plume material in each of these flows.

(3) The model calculates on an hourly (or appropriate steady averaging period) basis how the plume trajectory (and, in stable/neutral conditions, the shape) is deformed by each hill. Hourly profiles of wind and temperature measurements are used by CTDMPLUS to compute plume rise, plume penetration (a formulation is included to handle penetration into elevated stable layers, based on Briggs (1984)), convective scaling parameters, the value of H_c, and the Froude number above H_c.

h. Horizontal Winds

CTDMPLUS does not simulate calm meteorological conditions. Both scalar and vector wind speed observations can be read by the model. If vector wind speed is unavailable, it is calculated from the scalar wind speed. The assignment of wind speed (either vector or scalar) at plume height is done by either:

- Interpolating between observations above and below the plume height, or
- Extrapolating (within the surface layer) from the nearest measurement height to the plume height.

i. Vertical Wind Speed

Vertical flow is treated for the plume component above the critical dividing streamline height (H_c); see "Plume Behavior".

j. Horizontal Dispersion

Horizontal dispersion for stable/neutral conditions is related to the turbulence velocity scale for lateral fluctuations, σ_v, for which a minimum value of 0.2 m/s is used. Convective scaling formulations are used to estimate horizontal dispersion for unstable conditions.

k. Vertical Dispersion

Direct estimates of vertical dispersion for stable/neutral conditions are based on observed vertical turbulence intensity, *e.g.*, σ_w (standard deviation of the vertical velocity fluctuation). In simulating unstable (convective) conditions, CTDMPLUS relies on a skewed, bi-Gaussian probability density function (pdf) description of the vertical velocities to estimate the vertical distribution of pollutant concentration.

l. Chemical Transformation

Chemical transformation is not treated by CTDMPLUS.

m. Physical Removal

Physical removal is not treated by CTDMPLUS (complete reflection at the ground/hill surface is assumed).

n. Evaluation Studies

Burns, D.J., L.H. Adams and S.G. Perry, 1990. Testing and Evaluation of the CTDMPLUS Dispersion Model: Daytime Convective Conditions. Environmental Protection Agency, Research Triangle Park, NC.

Paumier, J.O., S.G. Perry and D.J. Burns, 1990. An Analysis of CTDMPLUS Model Predictions with the Lovett Power Plant Data Base. Environmental Protection Agency, Research Triangle Park, NC.

Paumier, J.O., S.G. Perry and D.J. Burns, 1992. CTDMPLUS: A Dispersion Model for Sources near Complex Topography. Part II: Performance Characteristics. *Journal of Applied Meteorology*, 31(7): 646–660.

A.6 Offshore and Coastal Dispersion Model (OCD)

Reference

DiCristofaro, D.C. and S.R. Hanna, 1989. OCD: The Offshore and Coastal Dispersion Model, Version 4. Volume I: User's Guide, and Volume II: Appendices. Sigma Research Corporation, Westford, MA. (NTIS Nos. PB 93–144384 and PB 93–144392; also available at *http://www.epa.gov/scram001/*)

Availability

This model code is available on EPA's Internet SCRAM Web site and also on diskette (as PB 91–505230) from the National Technical Information Service (see Section A.0). Official contact at Minerals Management Service: Mr. Dirk Herkhof, Parkway Atrium Building, 381 Elden Street, Herndon, VA 20170, Phone: (703) 787–1735.

Abstract

(1) OCD is a straight-line Gaussian model developed to determine the impact of offshore emissions from point, area or line sources on the air quality of coastal regions. OCD incorporates overwater plume transport and dispersion as well as changes that occur as the plume crosses the shoreline. Hourly meteorological data are needed from both offshore and onshore locations. These include water surface temperature, overwater air temperature, mixing height, and relative humidity.

(2) Some of the key features include platform building downwash, partial plume penetration into elevated inversions, direct use of turbulence intensities for plume dispersion, interaction with the overland internal boundary layer, and continuous shoreline fumigation.

a. Recommendations for Regulatory Use

OCD has been recommended for use by the Minerals Management Service for emissions located on the Outer Continental Shelf (50 FR 12248; 28 March 1985). OCD is applicable for overwater sources where onshore receptors are below the lowest source height. Where onshore receptors are above the lowest source height, offshore plume transport and dispersion may be modeled on a case-by-case basis in consultation with the appropriate reviewing authority (paragraph 3.0(b)).

b. Input Requirements

(1) Source data: Point, area or line source location, pollutant emission rate, building height, stack height, stack gas temperature, stack inside diameter, stack gas exit velocity, stack angle from vertical, elevation of stack base above water surface and gridded specification of the land/water surfaces. As an option, emission rate, stack gas exit velocity and temperature can be varied hourly.

(2) Meteorological data (over water): Wind direction, wind speed, mixing height, relative humidity, air temperature, water surface temperature, vertical wind direction shear (optional), vertical temperature gradient (optional), turbulence intensities (optional).

(2) Meteorological data:

Over land: Surface weather data from a preprocessor such as PCRAMMET which provides hourly stability class, wind direction, wind speed, ambient temperature, and mixing height are required.

Over water: Hourly values for mixing height, relative humidity, air temperature, and water surface temperature are required; if wind speed/direction are missing, values over land will be used (if available); vertical wind direction shear, vertical temperature gradient, and turbulence intensities are optional.

(3) Receptor data: Location, height above local ground-level, ground-level elevation above the water surface.

c. Output

(1) All input options, specification of sources, receptors and land/water map including locations of sources and receptors.

(2) Summary tables of five highest concentrations at each receptor for each averaging period, and average concentration for entire run period at each receptor.

(3) Optional case study printout with hourly plume and receptor characteristics. Optional table of annual impact assessment from non-permanent activities.

(4) Concentration files written to disk or tape can be used by ANALYSIS postprocessor to produce the highest concentrations for each receptor, the cumulative frequency distributions for each receptor, the tabulation of all concentrations exceeding a given threshold, and the manipulation of hourly concentration files.

d. Type of Model

OCD is a Gaussian plume model constructed on the framework of the MPTER model.

e. Pollutant Types

OCD may be used to model primary pollutants. Settling and deposition are not treated.

f. Source-Receptor Relationship

(1) Up to 250 point sources, 5 area sources, or 1 line source and 180 receptors may be used.

(2) Receptors and sources are allowed at any location.

(3) The coastal configuration is determined by a grid of up to 3600 rectangles. Each element of the grid is designated as either land or water to identify the coastline.

g. Plume Behavior

(1) As in ISC, the basic plume rise algorithms are based on Briggs' recommendations.

(2) Momentum rise includes consideration of the stack angle from the vertical.

(3) The effect of drilling platforms, ships, or any overwater obstructions near the source are used to decrease plume rise using a revised platform downwash algorithm based on laboratory experiments.

(4) Partial plume penetration of elevated inversions is included using the suggestions of Briggs (1975) and Weil and Brower (1984).

(5) Continuous shoreline fumigation is parameterized using the Turner method where complete vertical mixing through the thermal internal boundary layer (TIBL) occurs as soon as the plume intercepts the TIBL.

h. Horizontal Winds

(1) Constant, uniform wind is assumed for each hour.

(2) Overwater wind speed can be estimated from overland wind speed using relationship of Hsu (1981).

(3) Wind speed profiles are estimated using similarity theory (Businger, 1973). Surface layer fluxes for these formulas are calculated from bulk aerodynamic methods.

i. Vertical Wind Speed

Vertical wind speed is assumed equal to zero.

j. Horizontal Dispersion

(1) Lateral turbulence intensity is recommended as a direct estimate of horizontal dispersion. If lateral turbulence intensity is not available, it is estimated from boundary layer theory. For wind speeds less than 8 m/s, lateral turbulence intensity is assumed inversely proportional to wind speed.

(2) Horizontal dispersion may be enhanced because of obstructions near the source. A virtual source technique is used to simulate the initial plume dilution due to downwash.

(3) Formulas recommended by Pasquill (1976) are used to calculate buoyant plume enhancement and wind direction shear enhancement.

(4) At the water/land interface, the change to overland dispersion rates is modeled using a virtual source. The overland dispersion rates can be calculated from either lateral turbulence intensity or Pasquill-Gifford curves. The change is implemented where the plume intercepts the rising internal boundary layer.

k. Vertical Dispersion

(1) Observed vertical turbulence intensity is not recommended as a direct estimate of vertical dispersion. Turbulence intensity should be estimated from boundary layer theory as default in the model. For very stable conditions, vertical dispersion is also a function of lapse rate.

(2) Vertical dispersion may be enhanced because of obstructions near the source. A virtual source technique is used to simulate the initial plume dilution due to downwash.

(3) Formulas recommended by Pasquill (1976) are used to calculate buoyant plume enhancement.

(4) At the water/land interface, the change to overland dispersion rates is modeled using a virtual source. The overland dispersion rates can be calculated from either vertical turbulence intensity or the Pasquill-Gifford coefficients. The change is implemented where the plume intercepts the rising internal boundary layer.

l. Chemical Transformation

Chemical transformations are treated using exponential decay. Different rates can be specified by month and by day or night.

m. Physical Removal

Physical removal is also treated using exponential decay.

n. Evaluation Studies

DiCristofaro, D.C. and S.R. Hanna, 1989. OCD: The Offshore and Coastal Dispersion Model. Volume I: User's Guide. Sigma Research Corporation, Westford, MA.

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Schulman, L.L. and S.R. Hanna, 1986. Evaluation of Downwash Modification to the Industrial Source Complex Model. *Journal of the Air Pollution Control Association*, 36: 258–264.

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
RESEARCH TRIANGLE PARK, NC 27711

September 26, 2008

OFFICE OF
AIR QUALITY PLANNING
AND STANDARDS

MEMORANDUM

SUBJECT: Technical Issues Related to CALPUFF Near-field Applications

FROM: Roger W. Brode, Physical Scientist
U. S. EPA, OAQPS, Air Quality Modeling Group (C439-01)

Bret Anderson, Environmental Scientist
U. S. EPA, Region 7

TO: Tyler Fox, Leader
U. S. EPA, OAQPS, Air Quality Modeling Group (C439-01)

The purpose of this memorandum is to provide a discussion of technical issues related to the use of the CALPUFF modeling system for near-field regulatory applications, under EPA's *Guideline on Air Quality Models*, 40 CFR Part 51, Appendix W. The information provided in Attachment A is intended to supplement the recent Clarification Memo related to near-field regulatory applications of CALPUFF under Appendix W, dated August 13, 2008. As noted in the attachment, the discussion is not intended to be exhaustive, and may be updated as additional relevant information comes to light.

Attachment

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ATTACHMENT A

Technical Issues Related to Use of the CALPUFF Modeling System for Near-field Applications

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Air Quality Modeling Group

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September 26, 2008

CONTENTS

1. INTRODUCTION

EPA has recently issued a memorandum providing clarification of the regulatory status of the CALPUFF modeling system for near-field applications,[1] with transport distance up to 50 kilometers, based on guidance provided in EPA's *Guideline on Air Quality Models* ("*Guideline*"), published as Appendix W to 40 CFR Part 51.[2] This document discusses technical issues related to the use of the CALPUFF modeling system for near-field applications. The use of CALPUFF for near-field regulatory applications involving "complex winds" is addressed in Section 7.2.8 of the *Guideline*, which states that "the purpose of choosing a modeling system like CALPUFF is to fully treat the time and space variations of meteorology effects on transport and dispersion." The basic requirements for justifying use of CALPUFF for near-field regulatory applications consist of three main components:

1) a determination that treatment of complex winds is critical to estimating design concentrations;
2) a determination that the preferred model (AERMOD) is not appropriate or less appropriate than CALPUFF; and
3) a demonstration that the five criteria listed in paragraph 3.2.2(e) of the *Guideline* for use of CALPUFF as an alternative model are adequately addressed.

Each of these steps involves case-specific considerations. The criteria listed in paragraph 3.2.2(e) of the *Guideline* for use of an alternative model are as follows:

> "e. Finally, for condition (3) in paragraph (b) of this subsection [preferred model is less appropriate for the specific application, or there is no preferred model], an alternative refined model may be used provided that:
>
> i. The model has received a scientific peer review;
> ii. The model can be demonstrated to be applicable to the problem on a theoretical basis;
> iii. The data bases which are necessary to perform the analysis are available and adequate;
> iv. Appropriate performance evaluations of the model have shown that the model is not biased toward underestimates; and
> v. A protocol on methods and procedures to be followed has been established."

The discussion provided below is structured to address each of the three main components, and includes specific examples to illustrate some of the issues and concerns. This discussion is not intended to be exhaustive in relation to the range of issues and possible scenarios that may be encountered, since each application includes case-specific considerations, but to provide an indication of some of the issues that should be addressed in assessing the appropriateness of CALPUFF for use in near-field applications. Some of the information presented in this document is preliminary in nature, based upon current understanding of the CALPUFF modeling system from available documentation.

2. COMPLEX WIND DETERMINATION

Paragraph 7.2.8(a) of the *Guideline* provides the following examples of complex wind situations:

> "a. *Inhomogeneous Local Winds.* In many parts of the United States, the ground is neither flat nor is the ground cover (or land use) uniform. These geographical variations can generate local winds and circulations, and modify the prevailing ambient winds and circulations. Geographic effects are most apparent when the ambient winds are light or calm. In general these geographically induced wind circulation effects are named after the source location of the winds, e.g., lake and sea breezes, and mountain and valley winds. In very rugged hilly or mountainous terrain, along coastlines, or near large land use variations, the characterization of the winds is a balance of various forces, such that the assumptions of steady-state straight-line transport both in time and space are inappropriate."

An assessment of the potential influence of complex winds on design concentrations should be based on examining the source characteristics (release height and plume buoyancy) in relation to the local topography to determine whether the design concentrations would be adequately represented by a steady-state model. Any available information documenting typical flow patterns at plume height level(s) may also be used to inform that determination. However, use of CALMET-generated wind fields as "evidence" of the importance of complex winds involves circular reasoning, and is not sufficient justification.

For most situations involving elevated plumes with relatively nearby terrain at or near plume height, the "line-of-sight" plume impaction scenario will likely drive the design concentrations, for which the AERMOD model is considered appropriate. Complex winds are also not likely to play a significant role for applications involving low-level plumes or plumes dominated by building downwash influences, where the design concentrations would likely occur in the vicinity of the source. Applications where the controlling design concentrations are likely to be strongly influenced by valley stagnation and/or recirculation under persistent light wind conditions, and where that likelihood can be documented and justified, may be appropriate for consideration as a CALPUFF near-field application based on the criterion of the appropriateness of the preferred model. However, in these cases a clarification is needed regarding the relative appropriateness for these applications of the preferred model at the time of CALPUFF's promulgation, ISCST3, as compared to the current preferred model, AERMOD. Since AERMOD has been designed to handle lighter wind conditions than ISCST3 (less than 1 m/s), and includes a horizontal meander algorithm to account for increased lateral plume spread under such light wind conditions that includes upwind dispersion, it will generally be more appropriate for these conditions than ISCST3.

For low- to mid-level releases, with plume heights below the height of adjacent terrain features, but elevated enough to be transported beyond the immediate vicinity of the source, concern for valley channeling of winds and their importance relative to estimating design concentrations may be a factor for consideration of CALPUFF for a near-field application. If valley channeling or other complex valley circulations dominate plume transport enough that the design concentration is likely to be controlled by phenomena other than line-of-sight plume impaction, then consideration of CALPUFF for near-field application may be appropriate. Dominant valley channeling may also result in significant persistence of wind directions leading to elevated 24-hour average concentrations that could be underestimated by a steady-state plume model driven by single station meteorological inputs that do not reflect that persistence. However, some caution is needed regarding this line of reasoning. First, it is important to recognize that the appropriateness of AERMOD in this situation may depend upon whether meteorological data representative of plume transport are available. The lack of such representative meteorological data may be one of the justifications given for use of CALPUFF in these situations, based on the presumption that CALMET can simulate the important features of the wind field in the absence of representative data. However, justification of CALPUFF for this situation is dependent on the ability of CALMET to provide realistic non-steady-state meteorological fields, which may in turn also depend on the availability of representative meteorological measurements as inputs. These considerations highlight the importance of addressing item iii from paragraph 3.2.2(e) to ensure that "[T]he data bases which are necessary to perform the analysis are available and adequate." Issues related to that item are discussed in more detail in Section 4.3.

Another category of complex winds cited in paragraph 7.2.8(a) of the *Guideline* involves coastal influences, including lake or sea breezes. As with the complex terrain cases discussed above, the importance of complex wind influences for coastal applications may vary based on source characteristics and proximity to the coastline. The two major effects of coastal influences that are most relevant to this discussion are the land/sea-breeze circulation patterns, driven by differential heating of the land and water, and the localized effects of enhanced vertical mixing within the thermal internal boundary layer (TIBL), which forms during the daytime with onshore flow. The land/sea-breeze cycle typically includes a sea (or lake) breeze (onshore flow at the surface) during the daytime, as the land area responds faster to solar heating, followed by a weaker land breeze (offshore flow) at night. The TIBL is characterized by a convective boundary that grows with distance inland from the coast, with the layer above the TIBL reflecting the stably stratified air of the marine boundary layer. The TIBL can result in more limited vertical mixing for plumes released below the TIBL than would occur without the coastal influence, or in fumigation (rapid downward dispersion) for elevated plumes released into the stable layer above the TIBL. The potential importance of non-steady-state coastal influences on design concentrations is probably greater for elevated releases near the coastline than for low-level releases. The magnitude of the impact of non-steady-state effects will generally decrease with distance from the coastline.

The previous paragraphs focused on determining the importance of complex winds on design concentrations for different types of sources in various settings. However, many applications will involve a range of source types at different locations within the modeling domain, raising additional considerations. In these cases, the determination should take into account the relative importance of each source to the overall design concentration, based on emissions and other source characteristics. If a single source or single type of source will clearly dominate the design value, then the determination may be based primarily on an assessment of that source type. An additional consideration that may need to be addressed in cases involving multiple sources is whether plumes from different sources may effectively merge as a result of complex winds, resulting in higher impacts than would occur based on a steady-state modeling assessment. An example of this case would be multiple low-level releases within a complex of valleys or at different locations within the same valley that would likely merge in the bottom of the valley due to drainage flows under light wind, stable conditions.

Another situation where application of CALPUFF for the near field may be considered is a case where concentration estimates are needed in a Class I area that is located within the near-field domain, perhaps 10 kilometers from the source, and where the fetch from the source to the Class I area is characterized by a winding valley. While the source-specific considerations discussed above may still apply in this situation, additional factors may need to be considered. If the plume trajectory is expected to be channeled by the winding valley, one might conclude that getting the trajectory correct is the most important consideration in determining the Class I design concentration. However, such a finding might not be justified, for the same source, if it were a Class II application in which it was clear that the design concentration would occur on the side of the closest hill to the source (i.e., a line-of-sight source receptor relationship). This situation also highlights the issue of whether the non-steady-state capabilities of the CALPUFF modeling system can more appropriately address the temporal and spatial pairing of predicted vs. observed concentrations called for in such an application. Given the nature of the complex wind phenomena that might justify use of CALPUFF for near-field applications, the issue of temporal-spatial pairing of impacts is likely to be a consideration to some degree for all near-field applications of CALPUFF. This issue is discussed in more detail in the following sections.

It is important to recognize that while CALMET <u>can</u> generate spatially varying three-dimensional wind fields, this does not guarantee that the wind fields generated by CALMET will provide a more appropriate treatment of plume transport and dispersion, or result in an improved estimate of design concentrations compared to AERMOD. Furthermore, the mere presence of "complex winds" within a domain is not sufficient justification for use of CALPUFF for near-field applications. In a very real sense, every modeling application involves complex winds to some degree since the atmosphere is inherently inhomogeneous. The burden is in showing clearly that accounting for some aspect(s) of the complex winds is critical to an adequate determination of design concentrations for the source(s) of concern, and then demonstrating that CALPUFF is more appropriate than the preferred model and is capable of simulating those important aspects with an acceptable degree of confidence given the data available for the application.

3. APPROPRIATENESS OF THE PREFERRED MODEL

Once a credible determination has been made that treatment of complex winds is critical to estimating design concentrations, a separate determination should be made that the preferred model (AERMOD) is not appropriate for the application, or that CALPUFF is clearly more appropriate than the preferred model, based on condition (3) in paragraph 3.2.2(b) of the *Guideline* that "the preferred model is less appropriate for the specific application, or there is no preferred model"[2]. As noted in the EPA clarification memo[1], the promulgation of AERMOD as the preferred model for regulatory modeling in all terrain settings affects the applicability of this criterion for justifying the use of CALPUFF for such applications, due to the fact that AERMOD is considered to be appropriate for a wider range of applications involving terrain effects than was the case for ISCST3, the preferred model at the time of CALPUFF's promulgation. AERMOD's performance for near-field regulatory modeling applications in simple and complex terrain, with and without downwash, has been well-documented based on a total of 17 field study evaluation databases,[3,4] including several field studies in complex terrain settings. In contrast, there has been no comprehensive demonstration made that the CALPUFF modeling system, including CALMET-generated wind fields, performs as well or better than AERMOD for near-field regulatory applications in complex wind situations based on field study data. More information related to this point is provided in Section 4.2.

The case cited in Section 2 regarding a Class I area located in the near-field highlights the issue of whether the non-steady-state capabilities of the CALPUFF modeling system can more appropriately address the temporal and spatial pairing of predicted vs. observed concentrations called for in such an application. Unfortunately, this is a very difficult question to answer due to limitations of adequate field-study data bases, and due to the difficulty in generalizing model performance based on existing studies given the highly complex and site-specific nature of the problem. Further complicating the determination of appropriateness of CALPUFF for near-field applications is the fact that the limited evaluation studies documented thus far have not evaluated the skill of the modeling system to accurately simulate plume impacts under non-steady-state meteorological conditions paired in time and space over the domain. The question of appropriate model performance methods and metrics to support the determination of appropriateness of CALPUFF for near-field applications is addressed further in a separate document.[5]

While the need for temporally and spatially more realistic concentration fields provided by a non-steady-state model may arise in regulatory applications as described above, this issue may also be brought up in non-regulatory applications as a possible justification for use of CALPUFF in near-field applications. An example of the latter would be for risk assessment applications where the full spatial field of impacts may contribute to the determination of total risk or exposure, requiring additional skill from the dispersion model beyond that required for typical near-field regulatory applications, where peak concentrations unpaired in time and space are the primary metric for model performance. Many of the same concerns expressed regarding regulatory applications of CALPUFF in near-field settings would apply in these non-regulatory cases, but the added significance of temporal and spatial pairing of concentration fields with population distributions to determine exposures further increases the demand on model skill beyond what has thus far been demonstrated.

4. ALTERNATIVE MODEL CRITERIA

This section provides more details regarding the technical considerations involved in assessing the appropriateness of CALPUFF relative to the preferred model for potential near-field applications, based on the criteria for use of an alternative model listed in paragraph 3.2.2(e) of the *Guideline*.

4.1. Scientific Peer Review

The CALPUFF modeling system was subjected to a scientific peer review[6] to support the process of promulgating CALPUFF as a preferred model in the *Guideline*. While the primary regulatory niche for CALPUFF is for long range transport (LRT) applications, with transport distances beyond 50 kilometers, the scope of the scientific peer review also included the potential application of the model for near-field dispersion ($\leq$ 50 kilometers). The assessment of CALPUFF's appropriateness for near-field applications in the peer review comments is very general and limited. Only one reviewer explicitly addressed the Peer Review Charge question related to the adequacy of model performance evaluations and sensitivity studies to "recommend use of the model." That reviewer's comments were that it is "a very difficult set of questions to answer," but that the answer is "probably yes, because CALPUFF incorporates a basic formalism that is well understood and numerous algorithms, each of which has been reasonably well characterized individually." This reviewer also supports the response by noting that "the mesoscale and DWM [diagnostic wind model] modeling approaches used in CALMET have undergone a history of more than 20 years of test and evaluation in the meteorological and wind power communities." However, no specific examples of CALMET evaluation are cited in this peer review.

Given the reference in the peer review comments to tests and evaluations of diagnostic wind models for wind power applications, it is important to note that the requirements of wind field modeling for estimating wind power potential are very different from the requirements for near-field air quality impact assessments. Wind field modeling for wind power is typically designed to identify areas of high wind power potential and to provide a quantitative estimate of that potential for planning purposes. However, actual siting and installation of wind turbines would typically be further supported by more detailed site assessments. On the other hand, wind field modeling for near-field air quality assessments may determine whether or not an emission source will be constructed and permitted to operate at a given site, without any additional means of assessing potential impacts prior to operation.

It should also be noted that while model evaluations for wind power applications may be relevant to some near-field applications of CALMET, for the most part the meteorological conditions associated with high wind energy potential, i.e., high-wind/neutral conditions, are less technically challenging to simulate with acceptable accuracy than the meteorological conditions of most concern for air quality applications, i.e., light wind, stable conditions. These high-wind/neutral conditions will also be less subject to significant spatial variability in the wind field, thus making it more likely the peak concentrations will be through line-of-sight plume impaction on nearby terrain. As noted in paragraph 7.2.8(a) of the *Guideline* regarding the complex winds of interest for CALPUFF near-field applications, "geographic effects are most apparent when the ambient winds are light or calm."

The conclusion from this assessment is that the EPA-sponsored scientific peer review of the CALPUFF modeling system for near-field applications has been very limited in scope.

4.2. Applicability to the Problem

Since the stated goal of using a non-steady-state modeling system for a near-field complex wind situation is "to fully treat the time and space variations of meteorology effects on transport and dispersion," a significant part of the focus for addressing the applicability of the CALPUFF modeling system will be on the ability of CALMET to adequately simulate the non-steady-state meteorology. Given the very case-specific nature of near-field complex wind modeling applications, the criterion of applicability to the problem should be determined based on some of the case-specific considerations discussed in previous sections. The applicability determination should also be supported by relevant model performance demonstrations. As noted above, AERMOD's performance for near-field regulatory modeling applications has been well-documented based on a total of 17 field study evaluation databases[3,4], whereas there has been no comprehensive demonstration made that the CALPUFF modeling system performs as well or better than AERMOD for near-field regulatory applications in complex terrain based on field study data.

The one evaluation study often cited to support the use of CALPUFF for near-field applications is the Lovett power plant complex terrain field study[7]. While CALPUFF shows good performance for the Lovett evaluation, as documented in the IWAQM Phase 2 Report[8], the AERMOD model exhibits comparable performance results for that data set[3]. However, the published CALPUFF performance evaluation results for Lovett are not well-suited as a demonstration of CALPUFF modeling system performance for near-field complex flow applications for two important reasons. First, the Lovett field study consists of an elevated stack located in the Hudson River valley, with SO_2 monitors located along the adjacent ridges. This situation would not qualify as a complex flow application for CALPUFF since the effects of complex winds as defined in paragraph 7.2.8 of the *Guideline* are not expected to contribute significantly to the design concentration, which will clearly be dominated by the elevated plume impacting the adjacent terrain through a "line-of-sight" trajectory. Secondly, the published CALPUFF evaluation results for Lovett are based on use of the CTDM surface and profile meteorological inputs and use of the Complex Terrain algorithm for Sub-Grid-scale features (CTSG) option in CALPUFF, options that essentially emulate the CTDMPLUS model and bypass the CALMET meteorological processor completely[9]. Therefore, the published Lovett evaluation results provide no information on the performance of CALMET in simulating non-steady-state winds in this near-field setting.

The diagnostic wind field model in CALMET has some limitations that are important to recognize and understand in relation to the question of applicability for near-field applications. Some of these limitations are generic to the use of any gridded meteorological model, while other limitations stem from specific formulations within CALMET. A generic limitation of gridded models is that their ability to simulate terrain responding wind fields may be severely limited by the horizontal resolution of the input terrain and land use data as represented within the model grid. For example, a river valley that is about 1 kilometer wide from peak to peak and about 500 meters deep would not be adequately resolved by a 250 meter grid spacing, which has been a typical minimum grid resolution for near-field modeling. A single grid cell could span the entire valley wall from ridge top to river level, such that the slopes of the valley walls represented by gridded terrain elevations could be reduced for 50 percent or more, significantly affecting the gravity driven slope flows and other diagnostic wind field adjustments in CALMET. Vertical grid resolution will also be a significant consideration for near-field applications, especially in valley locations given the complex flow structures and significant vertical gradients that may occur in such situations.

Limitations that are inherent to CALMET formulations are largely due to its inability to ensure dynamical consistency in the simulated wind field. An example of the potential importance of this limitation is given by the phenomenon of drainage flows that often occur in valley situations under light-wind stable conditions. The three-dimensional structure of gravity-driven wind fields within a valley can be very complex, including significant discontinuities in wind direction with height. These wind fields are often associated with complex thermal structures within the valley that develop as cold air drains down from the ridge tops and accumulates within the valley. A transition from down-slope to down-valley flows will typically develop over time and with distance from the ridge, creating significant lateral and vertical gradients of wind and temperature. While limitations due to grid resolution may be important in these cases, a more fundamental limitation is CALMET's inability to simulate the thermal structures within the valley that are associated with these complex flows. The three-dimensional temperature fields computed within CALMET are based on either available upper air soundings and surface measurements or gridded prognostic model inputs, depending on user-specified options. The three-dimensional temperature fields are not adjusted to reflect the influence of these drainage flows. Furthermore, the terrain blocking effects in CALMET are determined based on a single domain-wide average lapse rate, typically computed across a layer from the surface up to 200 meters. Unless gridded meteorological inputs of sufficient resolution to capture these thermal structures within the valley are input to CALMET, they will not be reflected in the gridded CALMET outputs for use by CALPUFF. A potential consequence of this limitation is that the lapse rate used to compute plume rise in CALPUFF would not reflect the stable stratification generated by drainage flows, which could lead to an overestimation of plume height for buoyant releases and possible underestimation of ground-level concentrations. Even if the simulated wind fields within the valley are realistic, placement of the plume within the wrong grid layer due to these limitations in characterizing the thermal structure could result in significant errors in plume trajectory leading to impact estimates that reflect spatially-varying wind fields, but bear little or no resemblance to reality.

Finer grid resolutions may improve the capability of the model to simulate these complex flow structures to some degree, and may now be more feasible with the availability of finer resolution land cover and terrain data. However, CALMET currently requires that the first (lowest) grid level be 20 meters deep, and grid resolution alone cannot overcome other limitations of the model formulation. The computational burden will also increase significantly with finer grid resolutions unless the overall domain size is decreased, which could limit the applicability of the results by excluding important synoptic or mesoscale features that influence the complex winds. The sensitivity of model results to grid resolution needs to be investigated in order to assess the robustness of the model. Recent studies have shown significant sensitivity to grid resolution, with some evidence of a possible bias toward lower concentrations as grid resolution increases. These sensitivities to grid resolution are still being examined to determine the key contributing factor(s), and whether the results for finer grid resolution reflect improved model performance or are indicative of a potential bias toward underprediction.

While CALMET incorporates terrain-blocking and slope-flow algorithms that may account for some of the complex flows that occur in complex terrain settings, cross-valley circulations are also common occurrences in some valleys, driven by differential heating that occurs during the daytime as the sun heats one side of the valley wall while the other side is shaded. These circulation patterns will vary depending upon the orientation of the valley and solar elevation angle (based on time of day and season), and may significantly affect plume transport and dispersion depending on the location of the source relative to the valley orientation. CALMET currently does not account for these circulation patterns in the slope flow algorithms since there is no mechanism to account for the differential heating that drives the circulation. As a result, if these cross-valley circulations are important to the design value determination, then the applicability of CALPUFF would be limited.

As noted above, since "the purpose of choosing a modeling system like CALPUFF is to fully treat the time and space variations of meteorology effects on transport and dispersion," the applicability of CALPUFF for near-field situations may depend on the model's ability to estimate air quality impacts with skill in terms of the actual temporal and spatial distribution of impacts. If the modeling system lacks demonstrable skill in terms of temporal/spatial pairing of impacts, or at least demonstrably better skill than the preferred model, then the argument for applicability to the problem is seriously undermined. The lack of a detailed independent assessment of the applicability of the CALPUFF modeling system, and in particular the CALMET meteorological processor, for near-field applications involving complex winds raises serious doubts as to whether the second criterion of paragraph 3.2.2(e) has been adequately met in a general sense. As a result, the burden to demonstrate applicability for specific applications remains relatively high.

4.3. Availability of Necessary Data Bases

The appropriateness of a particular model for a given application may depend in part on the availability of the necessary data bases to support its use. For near-field applications of CALPUFF, the necessary data bases include meteorological data (both surface and aloft), terrain elevation data, and land use/land cover data. The quality and representativeness of available meteorological data will often be a critical, but difficult issue to address for these applications. Due to the very nature of complex wind applications, involving spatially non-uniform wind fields, the representativeness of meteorological measurements at particular locations within the domain relative to the dominant flow structures across the domain will be difficult to determine. The ability of the wind field model to properly account for these influences in its use of such data deserves further consideration.

The assessment of available data bases is further complicated by limitations of CALMET with respect to its ability to utilize site-specific meteorological measurements in generating the three-dimensional wind fields and thermal structures. The most direct approach for inputting site-specific meteorological measurements to CALMET is as surface observations. However, all surface winds, including National Weather Service (NWS) and site-specific data, are adjusted from anemometer height to the midpoint of the first CALMET level, which is hard-wired to 10 meters above ground. The default value specified for the controlling parameter in CALMET (IEXTRP = -4) is to extrapolate winds from anemometer height to 10 meters based on similarity theory profiling, including wind speed and direction adjustments. Even the CALMET option which is documented as the "no extrapolation" option (IEXTRP = 1) still extrapolates all surface wind speeds to 10 meters based on a neutral log profile. Meteorological measurements from multi-level towers, which may provide valuable information regarding vertical profiles of wind and temperature, can be input to CALMET as separate "surface stations" for each tower level, with different anemometer heights to reflect the measurement heights. However, for these cases CALMET will extrapolate winds for each tower level to 10 meters, and these collocated wind measurements will be represented by a single wind "observation" at 10 meters based on the average of the u- and v-components of the wind across the levels. This effectively destroys any site-specific information on the vertical wind profiles, which could compromise this aspect of the applicability determination.

The treatment of multiple levels of site-specific temperature data may be as important as the treatment of site-specific wind data in some cases. Multiple level temperature measurements could be used to determine a site-specific lapse rate to more accurately account for terrain-blocking effects and to calculate plume rise for buoyant releases. Similar to wind profiles, CALMET treats the multi-level temperature measurements as a single surface temperature based on an average across the levels. As with multi-level wind measurements, this not only loses any information on the vertical temperature structure reflected in the measurements, but replaces it with an inaccurate pseudo-observation.

Another option that may be considered for some near-field applications of CALPUFF is the use of gridded meteorological inputs from a prognostic meteorological model, such as MM5. Gridded prognostic meteorological data has been widely used for LRT applications of CALPUFF, and several options are available for utilizing such data within the CALMET meteorological processor. While prognostic models have been routinely applied for several years to simulating non-steady-state wind fields at meso- to synoptic scales (with grid resolutions of about 4 kilometers or greater), many complex wind phenomena that might prompt the need for a non-steady-state dispersion model will require treatment of smaller scales of motion. Advances in computing capabilities have allowed for finer-scale applications of these models in recent years. However, the issues of grid resolution discussed in Section 4.2 in relation to CALMET would also apply for prognostics models. Until such time as prognostic models have been demonstrated to be capable of simulating the necessary non-steady-state features of the wind field adequately for the CALPUFF model, effectively bypassing the need for a diagnostic model like CALMET, the user will be faced with the challenges associated with blending prognostic meteorological fields with observations.

The blending of prognostic meteorological data with observations is a generic issue related to the use of CALPUFF for both near-field and LRT applications, and some problems have been encountered with this aspect of the model. CALMET includes a number of options for controlling how observations are blended with prognostic model inputs, or with the initial guess wind field generated from upper air data in the absence of prognostic data. In general, CALMET applies an inverse-distance squared approach for the initial adjustment of gridded met winds to observations, and one of the key user-specified parameters is the radius of influence. While CALMET currently applies a single user-specified radius of influence for all surface observations, other options are available, such as barriers, to isolate the potential impact of some observations on certain portions of the domain. This technique may be necessary, for example, to restrict an observation taken in a river valley from influencing the wind field on the other side of the ridge.

These adjustments to the wind field to blend with observations lack any physical mechanisms that would ensure dynamical consistency of the blended wind fields. This can result in very unrealistic flow patterns within portions of the modeling domain if the observation differs from the initial guess wind field provided by the prognostic model. The blended wind fields are then smoothed and further adjusted to minimize divergence in most cases. While these latter steps may be reasonable for larger scale domains typical of LRT applications, their appropriateness for adjusting wind fields in near-field settings may be questionable. As noted above, the wind and temperature fields of importance to near-field complex wind applications may be characterized by sharp gradients both vertically and horizontally, and some of the important terrain-responding flows may also be inherently divergent. Applying simple techniques, such as inverse-distance weighting, smoothing, and divergence minimization may introduce unrealistic features to the wind field in near-field applications.

The other alternative to the treatment of inputting multi-level measurements to CALMET as separate surface observations is to construct a pseudo-upper-air sounding from the available measurements. However, this is not a very practical alternative and may require manufacturing data to extend the profile in some cases. This approach could also result in and may result in the site-specific profiles of wind and temperature being applied across portions of the domain for which they are not representative. The only option to directly utilize site-specific information on vertical wind and temperature profiles from multi-level towers in the CALPUFF modeling system is to bypass the CALMET processor and input the data directly to CALPUFF as CTDM or AERMET surface and profile files, as was done in the CALPUFF evaluation for Lovett. As noted above, the latter approach is not consistent with the intent of the *Guideline* for near-field applications of CALPUFF, which is to "fully treat the time and space variations of meteorology effects on transport and dispersion."

4.4. Appropriate Performance Evaluations

One of the requirements for the use of an alternative model stated in paragraph 3.2.2(e)(iv) of the *Guideline* is that "appropriate performance evaluations of the model have shown that the model is not biased toward underestimates." This is a somewhat less stringent requirement than that imposed for a preferred model, which is to demonstrate generally unbiased model performance across a range of evaluation studies. Previous sections have addressed some basic issues related to the lack of adequate model performance evaluations to support the use of CALPUFF for near-field applications, with the Lovett power plant evaluation being the case cited most often for near-field performance. Beyond the limitation noted above that the Lovett evaluation for CALPUFF did not utilize the CALMET-generated wind fields, the other issue related to performance evaluations that should be emphasized is that past model evaluation methods and metrics employed for regulatory model evaluations[10], which place little or no emphasis on temporal or spatial pairing of modeled and observed concentrations, do not adequately address the skill implied in the use of CALPUFF for most near-field applications.

The lack of appropriate performance evaluations to address this requirement for near-field applications of CALPUFF, together with a range of technical issues regarding the applicability of model algorithms and availability of adequate data bases, raises serious questions regarding whether the model can be applied with confidence that model results are not biased toward underestimates. The complexity of the model formulations and the range of options available for data input, grid resolution, wind field adjustments, etc., suggests a potentially wide range of sensitivity of modeled concentrations. These sensitivities need to be more fully documented and understood in order to build more confidence in whether and how this criterion can be met.

Preliminary results from our reassessment of the CALPUFF modeling system performance[5], including evaluations of CALPUFF for the Lovett database utilizing CALMET-generated wind fields, have documented the sensitivity of the model to some of the technical issues discussed above, such as grid resolution and treatment of site-specific meteorological inputs. The reassessment of CALPUFF model performance has also raised additional concerns regarding the theoretical basis for the applicability of CALPUFF to near-field complex wind situations, which are still being analyzed, and will be further documented as appropriate.

4.5. Modeling Protocol

A modeling protocol establishing the methods and procedures to be followed is one of the criteria identified in paragraph 3.2.2(e) of the *Guideline* for use of CALPUFF as an alternative model for near-field applications. Given the complex technical issues and concerns discussed in previous sections in relation to use of CALPUFF for these applications, the importance of the modeling protocol cannot be overstated. The protocol should address each of the criteria discussed above, starting with the determination that treatment of complex winds is critical to estimating design concentrations, and providing justification for the determination that AERMOD is not appropriate or less appropriate than CALPUFF for that application.

The modeling protocol should provide an adequate demonstration that CALPUFF is applicable on a theoretical basis given the specifics of the particular application. The adequacy of the available data bases needed to apply CALPUFF, including the capability of the CALPUFF modeling system to effectively utilize the available data, should also be addressed. In addition to addressing the criteria in paragraph 3.2.2(e) of the Guideline, the modeling protocol should provide detailed information regarding the data sources to be used as input to the model, grid resolutions, model option settings, and how the resulting wind fields will be assessed to determine their adequacy for the particular application.

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March 23, 2012

Ms. Deborah Jordan
Air Division
USEPA Region 9, AIR-1
75 Hawthorne Street
San Francisco, California 94105

Dear Ms. Jordan:

Subject: Investigation of Causes of PM10 Standard Exceedances at
Coso Junction, California, in 2011

On January 18, 2012, the Los Angeles Department of Water and Power (LADWP) wrote a letter to you expressing concern about the Great Basin Unified Air Pollution Control District's (District) inconceivable determination that the PM_{10} exceedance recorded at the Coso Junction monitor on February 8, 2011, "would not have occurred without emissions from Owens Lake." LADWP has not yet received a response to that letter, nor a response to an earlier letter dated September 15, 2011.

In our January 18, 2012, letter, LADWP noted the following concerns with the District's monitoring network and modeling analysis:

1. Premature and speculative statements regarding three other PM_{10} exceedances that occurred at Coso Junction: December 22, 2009, November 30, 2011, and December 1, 2012.

2. Failure to operate an Environmental Protection Agency-approved monitoring network with an approved Quality Assurance Project Plan (QAPP) for PM_{10}.

3. Failure to acknowledge that a regional dust event occurred on February 8, 2011, which produced high dust concentrations at all of the District monitors between Mono Lake and Coso Junction.

4. The use of inappropriate emission rates (K-factors) in its Dust ID modeling analysis of Owens Lake dust sources.

5. The use of inappropriate incoming (background) concentrations, effectively downplaying the impact of the regional dust event.

6. Failure to characterize and include the known off-lake dust source areas in the Dust ID model, or even to acknowledge that the upwind monitors are being influenced by nearby, but still unknown, off-lake sources.

7. Failure to address any of the technical issues raised in our September 15, 2011, letter to the United States Environmental Protection Agency (USEPA), a copy of which was provided to the District.

LADWP asserted then, and again now, that the deficiencies in the District's Dust ID modeling analysis have resulted in the District's unfair and unsupported claim that Owens Lake was the cause of the exceedances at Coso Junction. The District, as a public agency, cannot disregard the law (as they have by operating an extensive monitoring network without the required QAPPs) nor should they be allowed to continue to downplay, or otherwise ignore, impacts and emissions from other dust sources in the area that may be causing or, at a minimum, contributing to the exceedances at Coso Junction.

Failure to Comply with Coso Junction Maintenance Plan

LADWP is concerned that the District may not be complying with the Coso Junction Maintenance Plan requirements, which requires them to investigate the causes of any exceedance within 60 days. In a letter to the USEPA dated December 22, 2011, the District announced that there were four possible PM_{10} exceedances at the Coso Junction monitor from 2009 through 2012, and then added: "*We will provide a preliminary analysis of the November 30 and December 1, 2011 monitor exceedances at Coso Junction within 60 days from the end of this calendar quarter.*"

The 2010, PM_{10} Maintenance Plan and Redesignation Request for the Coso Junction Planning Area (Coso Junction Maintenance Plan) dated May 17, 2010, requires that the investigation be completed within 60 days. On page 13, it states (emphasis added):

> *"The District is authorized to continue daily ambient PM10 monitoring at Coso Junction (CH&SC § 40001). If an exceedance of the federal PM10 standard is monitored the District will investigate the cause of the exceedance* ***within 60 days following the end of the calendar quarter*** *during which the event occurred. Exceedances found to be caused by dust from Owens Lake will be investigated to determine if the required control measures were properly implemented in accordance with Board Order #080128-01. Exceedances found to be caused by dust from local sources that are subject to current District regulations will be addressed and corrected. Exceedances found to be caused by Exceptional Events, such as wildfires or earthquakes will be flagged in accordance with USEPA policy (Federal Register, 2007)."*

The required 60-day period expired on March 1, 2012. However, LADWP is unaware of any follow-up analysis from the District. Note that the Coso Junction Maintenance Plan requires the District to investigate the *cause* of the exceedance, including "local sources" and "Exceptional Events." The District has not conducted a comprehensive investigation of the causes of this exceedance. The analyses presented by the District simply assumed that Owens Lake was the sole cause of the exceedance without investigating any other possible sources. Similarly, the modeling analysis used by the District to identify the magnitude of impact from Owens Lake ignored other non-Owens Lake sources even though abundant evidence exists showing that the exceedances recorded at the Coso Junction monitor on February 8, 2011, were part of a regional dust event extending throughout the Owens Valley.

The magnitude of the contribution from Owens Lake is very much in disagreement because of various errors in the District's Dust ID modeling analysis. The Dust ID model has been parameterized for use on and immediately around the Owens playa. The District has not presented any evidence showing that the Dust ID model has acceptable performance given the long distances (18 miles) between the Owens playa and the Coso Junction monitor. Without this, LADWP has little confidence that the Dust ID model can be used to accurately assess the contribution from the Owens playa, or for that matter, from any other sources affecting the Coso Junction monitor.

Photographic Evidence of Off-Lake Sources in the Vicinity of the Coso Junction Monitor

LADWP recently completed a photographic reconnaissance of possible dust source areas located between the Owens playa and the Coso Junction monitor (refer to enclosed Attachment A, Figure 1). The purpose of the reconnaissance was to show that other, possible dust source areas do exist in the vicinity of the Coso Junction monitor. Sites were initially identified and then photographed from the air (helicopter) and on the ground. The source areas include:

- Numerous dirt roads crisscrossing the desert north of the monitor (Figures 1 and 17).
- Sparsely vegetated desert area adjacent to, and extending for a long distance north of, the Coso Junction TEOM (Figures 2 through 6).
- The 400-acre former hay field located two miles north of the Coso Junction monitor, which shows evidence of construction beginning in 2009 of a road network, a groundwater pumping station, an electrical substation, as well as other unknown areas of surface disturbance (Figures 7 through 12).

- The 200-acre "Northern Area" (another fenced field, presumably used in the past for agriculture) located roughly four miles north of the Coso Junction monitor (Figures 13 through 16).

All of the surfaces shown in these photographs are substantially non-vegetated or otherwise protected from wind erosion, possess sandy or friable soil surfaces, and show signs of recent wind erosion, as evidenced by sand and sand-sized particles freshly captured on the lee sides of obstructions (e.g., fences, clumps of vegetation). These areas are likely *all* emissive during high-wind events. To our knowledge, the District has not investigated any of these potential dust source areas to determine their contribution to the Coso Junction dust concentrations.

Without additional evidence and scientifically valid analysis, the District cannot possibly make a credible claim that Owens Lake is the only or dominant source affecting the Coso Junction monitor. LADWP requests that the USEPA reject the District's claim that the PM_{10} exceedance recorded on February 8, 2011, would not have occurred without emissions from Owens Lake on the grounds that it has not properly identified the causes of the exceedance, nor satisfactorily ruled out the contribution from non-Owens Lake sources.

Sincerely,

ORIGINAL SIGNED
BY MARTIN L. ADAMS

Martin L. Adams
Director of Water Operations

WTVW:rdn
Enclosure
c: Matthew Lakin, Ph.D., United States Environmental Protection Agency
Mr. Larry Biland, United States Environmental Protection Agency
Mr. Michael Flagg, United States Environmental Protection Agency
Ms. Sylvia Oey, California Air Resources Board
Mr. Theodore D. Schade, Great Basin Unified Air Pollution Control District

Appendix A:
Photographic Evidence of Possible Non Owens Lake Dust Sources in the Vicinity of the Coso Junction Monitor

Figure 1. Coso Junction Area Map and Photograph Location Key

Landscape north of Coso Junction TEOM, with photograph locations and directions marked along with major emission sources identified in photographs.

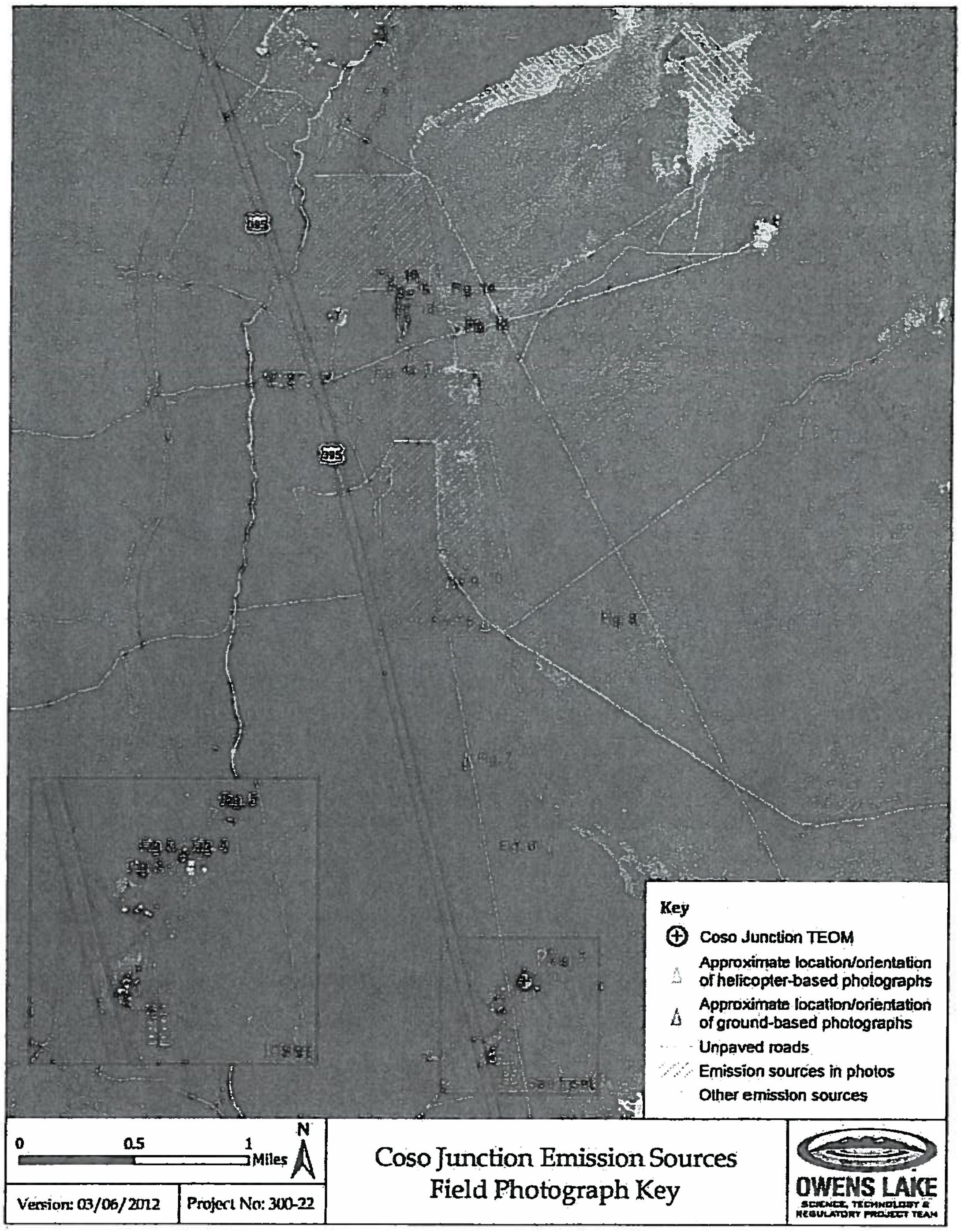

Figure 2. Coso Junction TEOM (Looking Toward the Northeast)

Shown are the TEOM (far right), meteorological tower (center), and typical vegetation and surfaces north of the TEOM.

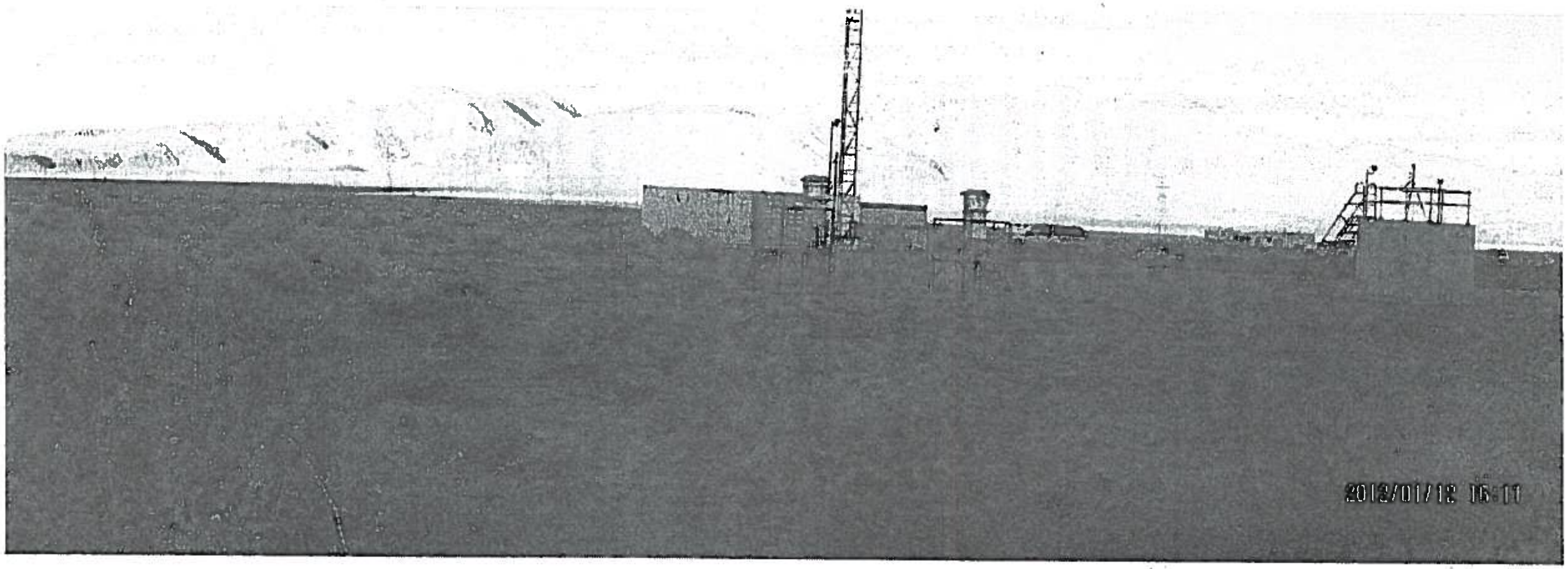

Figure 3. Typical Soil Surface and Vegetation just North of Coso Junction TEOM (Looking Toward the North)

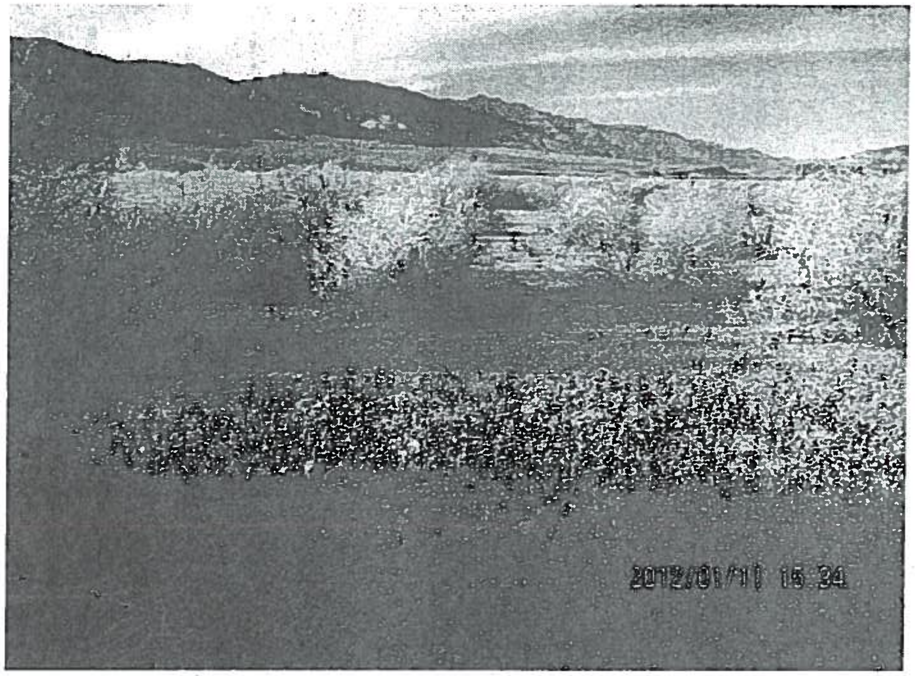

Figure 4. Close-up of Surface Shown in Figure 3.

Shown are surface close-ups before and after scuffing with foot. Note the abundance of fines in these loosely consolidate soils.

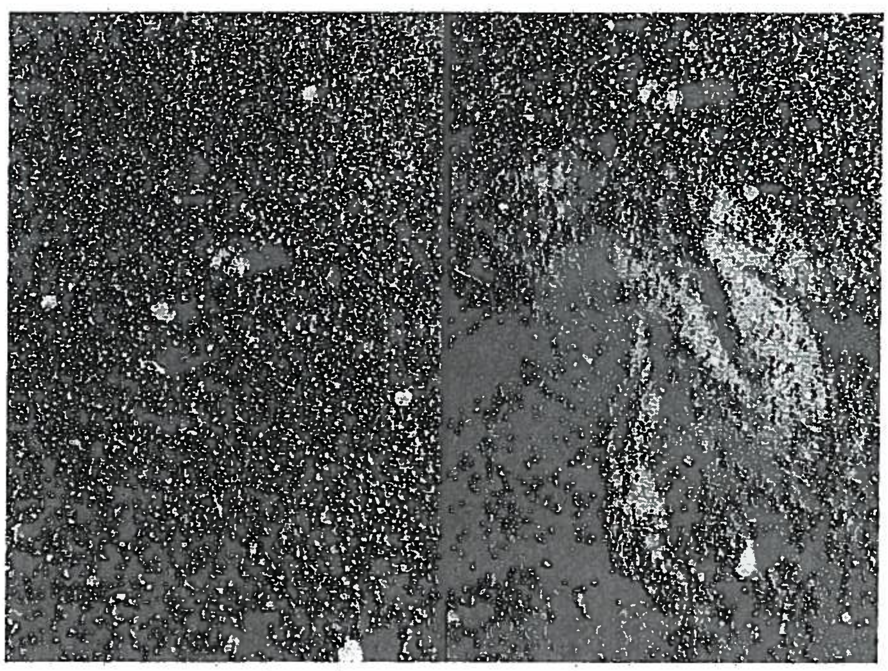

Figure 5. Coso Junction TEOM from Helicopter (Looking Toward the Southwest)

Shown are the TEOM (small white cube, center left) and typical vegetation and surfaces north of the TEOM (foreground).

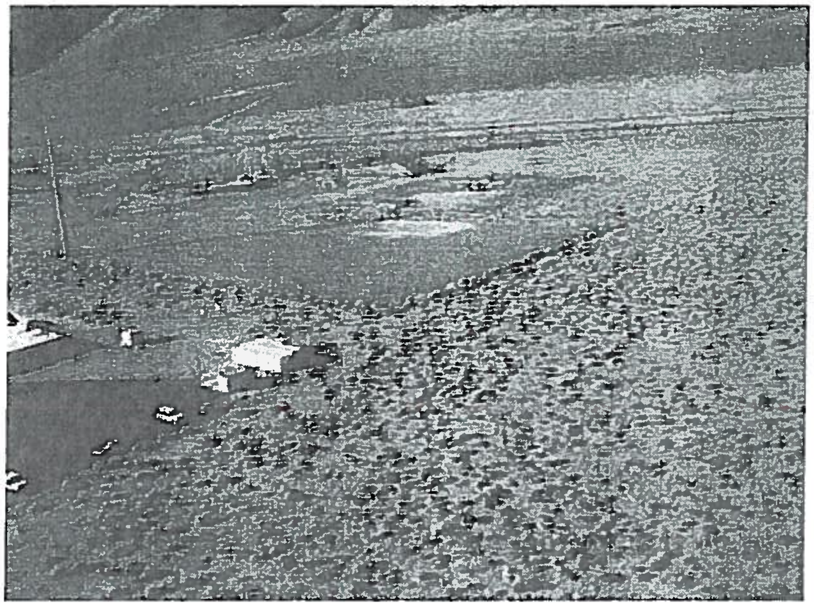

Figure 6. Powerline Road, Located Directly North of and in Line with Coso Junction TEOM (Looking Toward the South)

Figure 7. View of the Former Hay Field from Helicopter (Looking Toward the North)

Shown are the former Hay Field (middle distance) and unpaved roads crisscrossing the landscape.

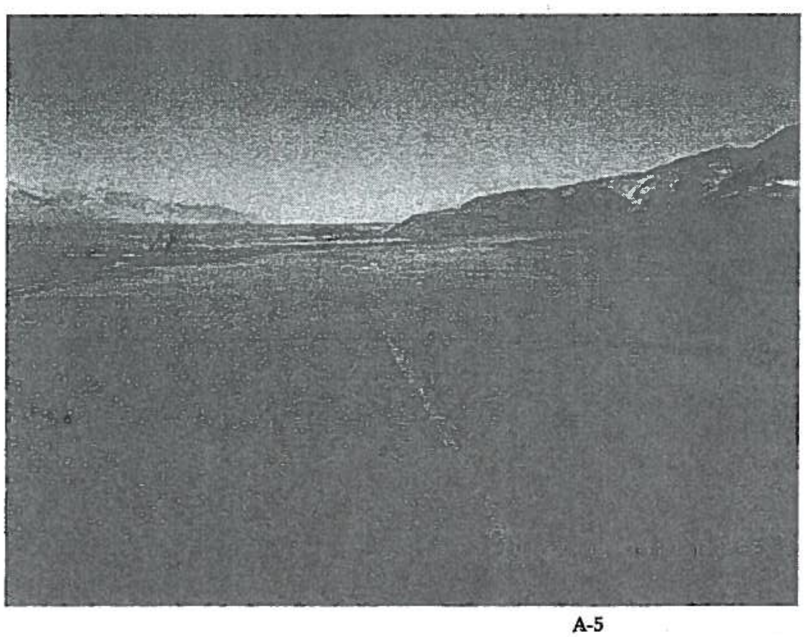

Figure 8. Elevated View of the Rose Valley (Looking Toward the Northwest)

Shown are approximate boundaries (as seen from the foothills east of Coso Junction) of two potential emissive areas: the former Hay Field outlined in green, and the Northern Area outlined in red.

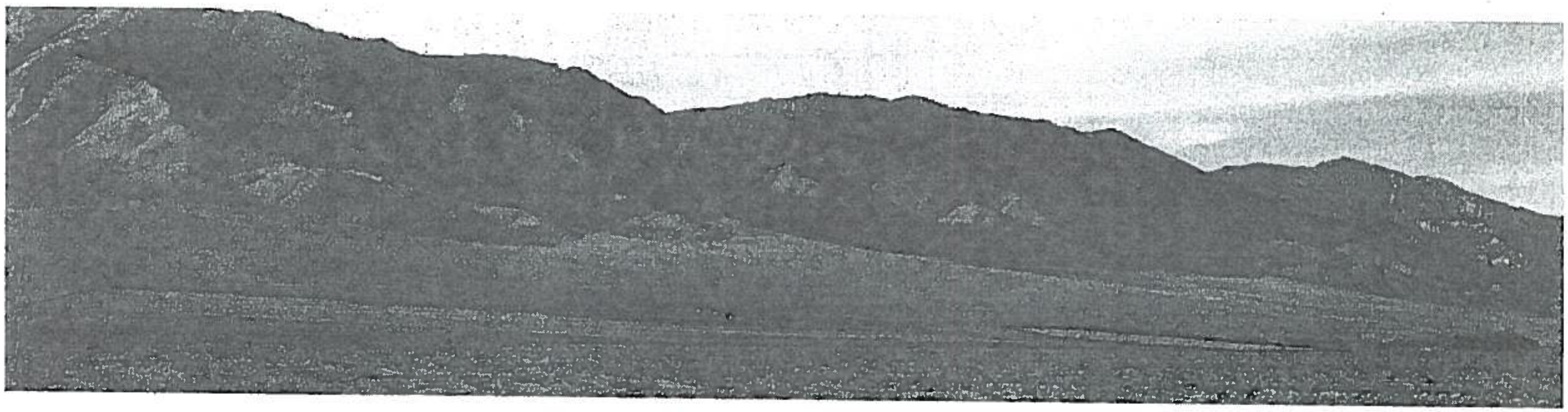

Figure 9. Blow Scar in Southeast Corner of Former Hay Field

Shown is a close-up of the blow scar (panel A), and buildup of eroded materials in fence looking north and south (panel B and C, respectively). All photos were taken standing in the same location.

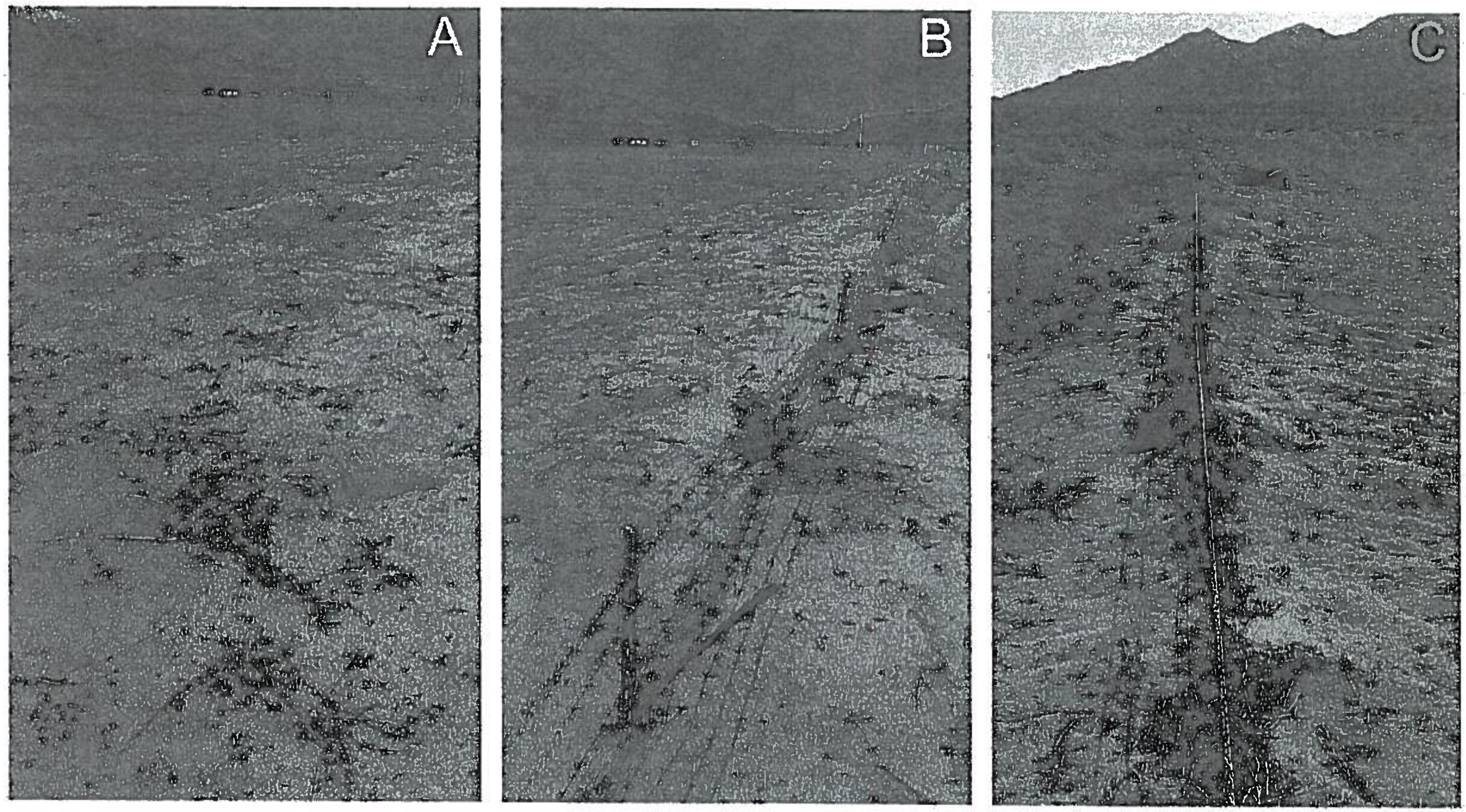

Figure 10. View of the Former Hay Field from Helicopter (Looking Toward the North)

Shown are the former Hay Field with groundwater pumping station (lower left), unpaved roads, and electrical substation (gray block located slightly above and to the right of center).

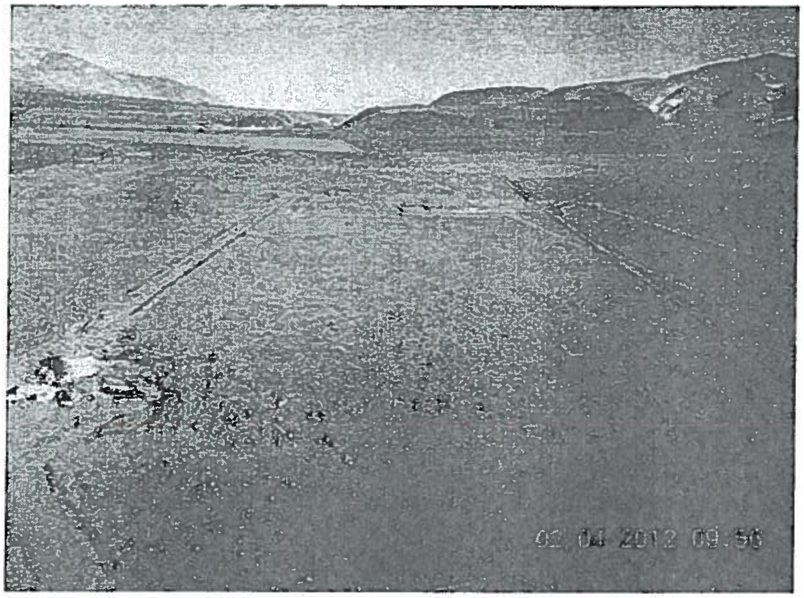

Figure 11. View of the Former Hay Field (Looking Toward the South from the Northern Edge)

Note rabbit fence in foreground.

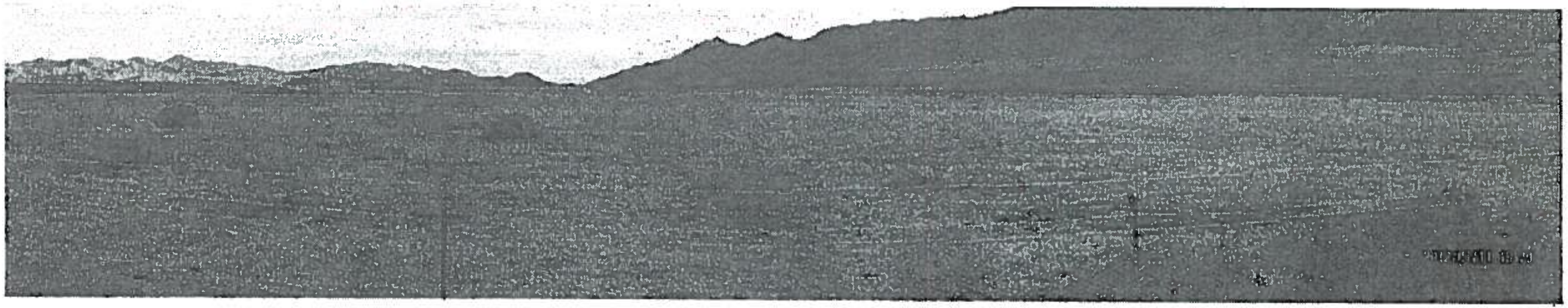

Figure 12. View of the Northern Area from Helicopter (Looking Toward the Northwest)

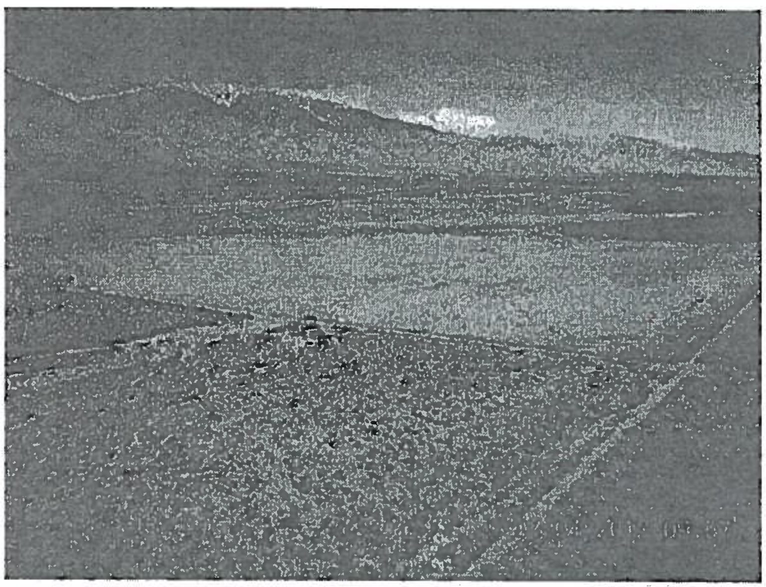

Figure 13. Naturally Vegetated Area in the Rose Valley (Looking Toward the East)

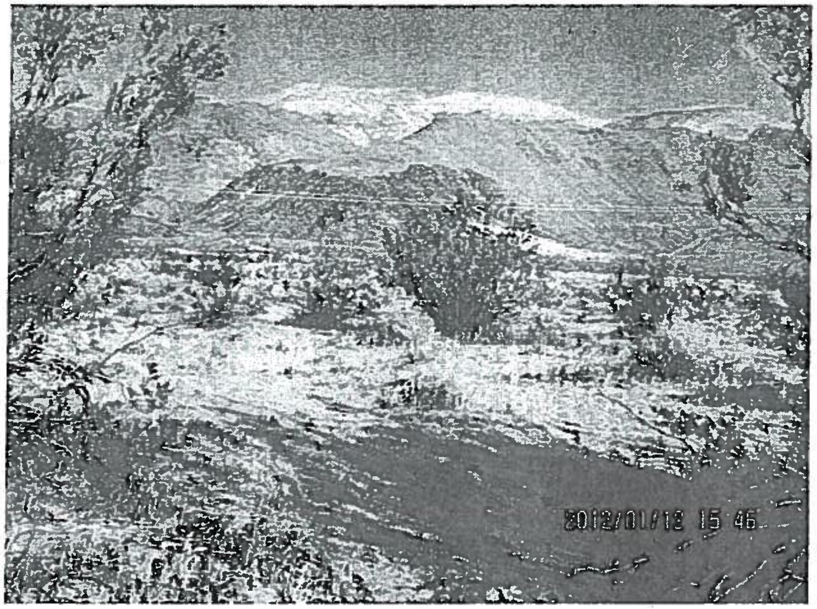

Figure 14. View of Northern Area from the Southeast Corner of Site (Looking Toward the Northwest)

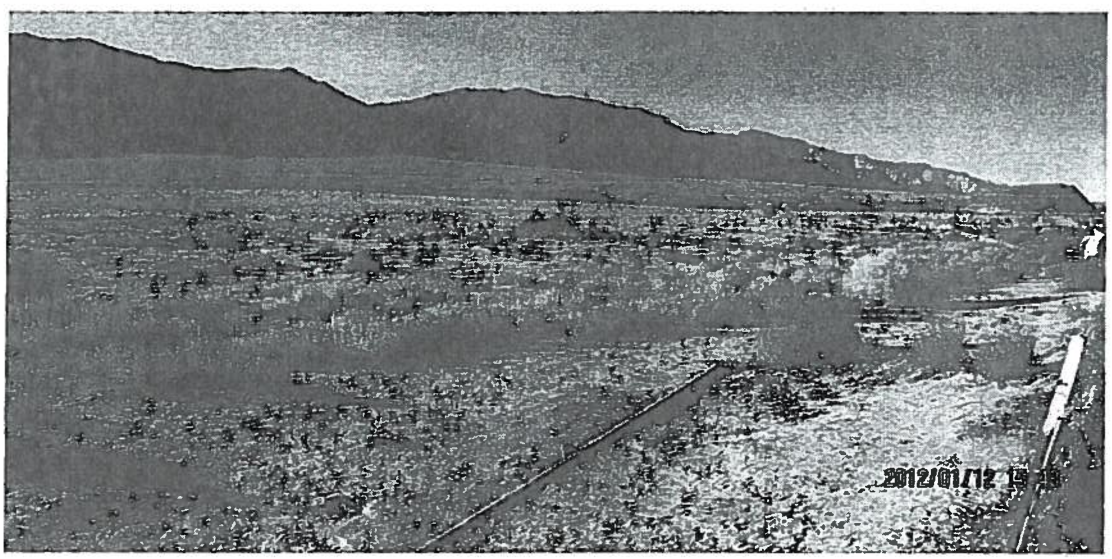

Figure 15. Sand Accumulation Behind the Northern Area's Southern Fence (Looking Toward the West)

Figure 16. Disturbed Sandy Surfaces within the Northern Area (Looking Toward the North)

Figure 17. The Former Hay Field on Google Earth – Comparison of 2007 and 2009 Images

Both images show the extent of blow scars from wind erosion (light colored regions). The 2009 image also shows the start of construction of the pump stations for the geothermal power plant on the southern portion.